TECHNOLOGY DEPT.

FLIGHT

MAGAZINE

Including SOUTHERN FLIGHT and MODERN AIRPORTS

SEPTEMBER 1951
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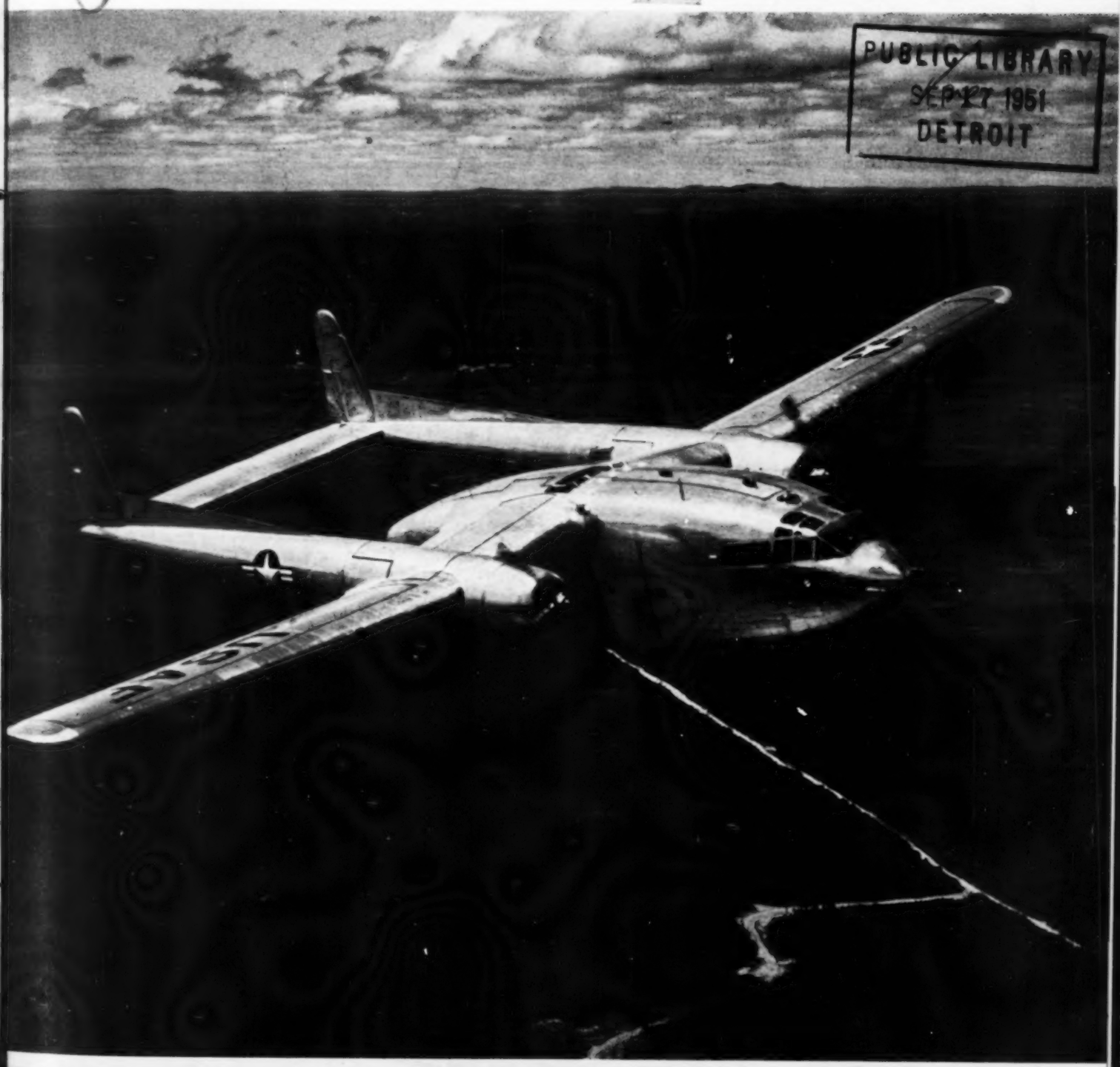

FAIRCHILD C-119 AT WORK

LONGVIEW TEXAS

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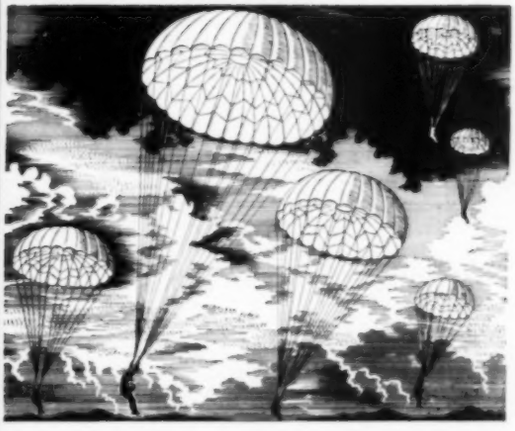

Parachutes harness the law of gravitation and make it serve our flyers and our fighting men. Through scientific design and precision planning vital cargoes can be floated to earth, ready for instant use where they're needed most.

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UTILITY UNLIMITED . . . .

The versatile utility of the helicopter has been dramatically demonstrated in the Korean war. Previously considered by many to be merely a flying freak, the amazing Bell copters have enacted a wide variety of roles ranging from those of flying ambulances and blood banks to serving as aerial jeeps. Bell H-13 D's, U. S. Army designation, pictured here, have evacuated more than 2500 seriously wounded U. N. troops from front line positions in six months. HTL-4 is the U. S. Navy designation. At Bell Aircraft's Plant #1 in Fort Worth, these copters are fueled with Mobilgas Specification Aircraft.

Mobilgas AIRCRAFT

FORWARD WITH *Aviation*

Mobiloil AERO

MAGNOLIA PETROLEUM COMPANY

Sweeping past the 1,000,000th hour

SOMEWHERE in the World, on a flight from an American base—at home, in Alaska, in Japan or somewhere in Europe, or from the deck of a Navy carrier, an unknown jet pilot has just made aviation history.

Reports just tabulated from fighter squadrons all over the world, record that Allison-powered jets recently swept past the 1,000,000th hour mark to establish another "*first*" for these famous Allison J33 and J35 Turbo-Jet Engines.

More than 10,000 of these high-powered, battle-proved engines are piling up a record of availability and reliability never before equaled. They lead the world in experience—in actual time in the air. And, even more important — these Allison engines have met *and have exceeded* every military specification for operation and performance — *under the stern test of combat!*

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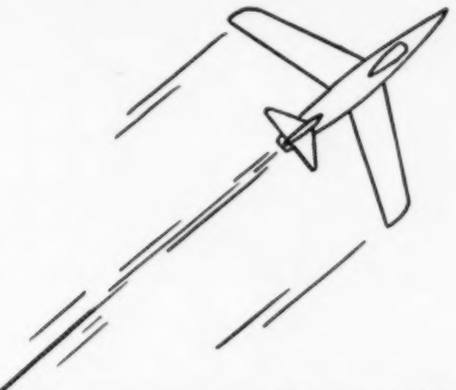
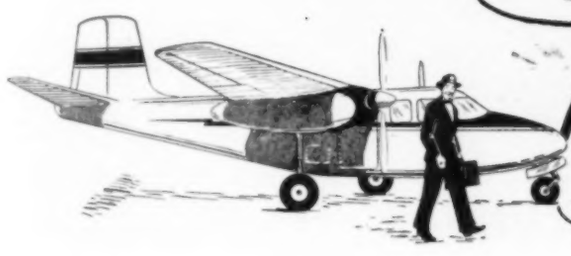


1160 MILES ON ONE ENGINE

- Non-stop from Oklahoma City to Washington, D. C.
- Take-off with full gross load.
- Normal cruising power settings.
- 13.6 gallons per hour.
- 147 miles per hour.
- Pioneering a new era in twin engine safety.



AERO DESIGN Commander

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Mail. Address: Box 118, Bethany, Okla.—Ph. 99-3700
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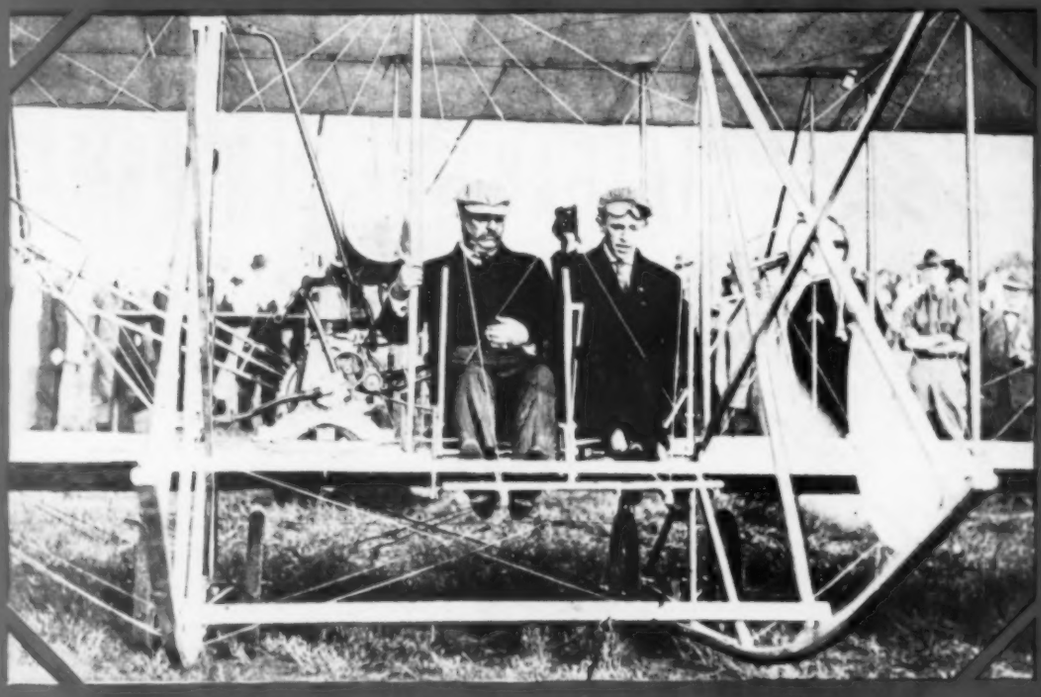
Horne says temporary omni shutdowns will occur again when installa-

proaches and landings using power and flaps at the discretion of the

"T.R." TAKES TO THE AIR...



One of the earliest VIP's to fly was "Teddy" Roosevelt. In October 1910, Roosevelt flew with pioneer pilot "Arch" Hoxsey at the St. Louis Aero Club flying meet.

LEGEND says that Theodore Roosevelt asked Arch Hoxsey for permission to fly the machine himself shortly after takeoff. Perhaps he followed through on the controls briefly, but there is no record of the former Chief Executive actually flying a plane.

Hoxsey was a member of the Wright Flying Team. Piloting his 4-cylinder Wright biplane (span 39 feet, chord 6 feet 6 inches RPM 450), Hoxsey captured an altitude record at Los Angeles in 1910. That same year he set an American record for "sustained flight" with a trip from Springfield, Illinois to Clayton, Missouri.

Daring exploits fill the pages of flying's history. And paralleling this record of adventure is another record of sober, scientific research. In one phase of this research, that of aviation fuels and lubricants, Phillips Petroleum Company has played a conspicuous part. Phillips has long been a leader in the development of new fuels. Today, Phillips is a major producer of top grade aviation gasoline for military and commercial planes. And, already, Phillips is delivering much new fuel for turbo-props and jets.

When you need dependable aviation products . . . high octane gasoline, jet fuels, aviation oils and lubricants . . . call on Phillips. The Aviation Department, Phillips Petroleum Company, Bartlesville, Oklahoma.

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AVIATION PRODUCTS

AIR Report

Significant Trends and News

CONTINENTAL MIDGETS NEARED 200 MPH. WITH 90-HP. ENGINES in the National Air Races at Detroit last month. John Paul Jones of Van Nuys, Calif., won with a record 197.218 mph. average for 15 laps of the 6-pylon, 2.5-mi. course, in his "Shoestring," as compared with the 165.857-mph. victory of Bill Brennand of Oshkosh, Wis., in the first midget races of 1947. Continental engines of 190-cu. in. displacement are turned about 3,600 rpm. for such speeds. Second and third-place honors this year went to Steve Wittman of Oshkosh (192.174 mph.) in his "Bonzo" and Keith Sorenson of La Crescenta, Calif., (187.476 mph.) in his "Smith Special." All other races were military events, the Continental Motors Trophy Race being the only one with cash awards remaining on the program.

MILITARY AIR RACE RESULTS: Bendix Trophy (1,919 mi. non-stop from Muroc, Calif., to Detroit)—Col. K. K. Compton, North American F-86A, 551.761 mph.; Col. E. S. Davis, Republic F-84E, 534.847 mph.; Lt. Col. G. B. Thabault, North American B-45, 532.637 mph. Thompson Trophy (62.14-mi. closed course), Col. Fred J. Ascani, North American F-86E, 628.698 mph. Chicago-Detroit Jet Speed Run, Col. Omer J. Reichman, North American F-86A, 672.189 mph.; Allison Trophy Race (Detroit to Indianapolis and return)—Lt. W. D. Baisley, Republic F-84E, 580.512 mph.; Lt. Col. W. E. Bertram, F-84E, 572.395 mph.; Lt. Jacob Kratt, Jr., F-84E, 521.825 mph.

SPEED RANGE OF THE REDESIGNED HELIO COURIER, an experimental 4-place metal-and-fabric high-wing monoplane developed by Helio Aircraft Corp., of Norwood, Mass., is now 35 mph. for slow flight with complete control to 150 mph. for cruising, according to the company. It is powered by a 260-hp. Lycoming and features leading-edge slats and trailing-edge flaps.

FIRST PRODUCTION-MODEL AERO COMMANDER was rolled off the assembly line at Oklahoma City on August 24, making its first flight. Sales Manager Carl Wootten reports orders with deposits now total over 40 airplanes, including recent orders from Brazil, Iran and Mexico. Leslie H. Bowman, operator at Cody, Wyo., and Fort Worth, Texas, has been named Aero Commander distributor for Wyoming and Eastern Montana.

78 LOW FREQUENCY RADIO RANGES will be maintained permanently by CAA. Administrator Charles Horne says temporary omni shutdowns will occur again when installations of distance measuring equipment (DME) begins, but that care will be taken not to shut down stations which are contiguous.

WRITTEN EXAMS FOR PRIVATE PILOT RATINGS are now required in connection with CAA's new aeronautical knowledge, experience and skill standards. Questions are from the recently-published CAA booklet, "Questions and Answers for Private Pilots" on sale at 15 cents each. Fifteen hours of dual instruction and 25 hrs. of solo practice are required for a private pilot certificate. Five hours of the dual must have been cross-country, 3 hrs. of which shall have been received before the first solo cross-country, and 10 hrs. of solo practice shall have been in cross-country flight including one flight with a landing at least 100 miles from the point of departure. The new flight test will include prevention and recovery from stalls entered from all normal attitudes, turns around a point or area on the ground, accurate approaches and landings using power and flaps at the discretion of the applicant, a demonstration of cross-country flight planning and flying, cross-wind take-offs and landings, and short or soft-field take-offs.

500 HOURS OF FLYING TIME WITHOUT THE AID OF MINOR REPAIRS has been reported as the first such case by the Air Force on an Allison J-33-A-35 jet engine in a 2-pl. Lockheed T-33 trainer, based at Otis Air Force Base, Falmouth, Mass.

CESSNA WILL PRODUCE MAJOR COMPONENTS FOR SWEPT-WING F-84F FIGHTERS at its Hutchinson, Kansas, plant which was recently reopened. The work is on a contract from General Motors, which is building the Republic F-84F at Kansas City.

TRANSIENT MILITARY AIRCRAFT REFUELING AT DALLAS is now performed by Southwest Airmotive at Love Field, this service being discontinued at nearby Hensley

(Continued on Page 38)

FLIGHT MAGAZINE

Including SOUTHERN FLIGHT and MODERN AIRPORTS

SEPTEMBER, 1951 VOL. 36, No. 3

COVER: The Fairchild C-119 Flying Boxcar on our cover has been flying heavy equipment and machinery from the St. Lawrence River port of Seven Islands, Quebec, to ore fields at Knob Lake, Labrador, inaccessible except by air. A railroad is being pushed across the 320-mile wilderness route. The C-119 was made available by the USAF because of the defense value of the ore development project. Hundreds of tons of heavy machinery and equipment, including huge construction timbers, are being flown into the ore fields.
—(Fairchild Aircraft Photo.)

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GEORGE E. HADDAWAY, Editor-Publisher; TOM ASHLEY, Managing Editor; FRED N. STONES, JR., Business Manager, P. O. Box 750 (1901 McKinney Ave.), Dallas, Texas

West Coast Representatives, TED SCHELL and STAN BROWN, 1200 Rives-Strong Bldg., Tel. Vandike 8921, Los Angeles

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Just

PRIVATE AVIATION'S FINEST GYRO OVERHAULS!

The Southwest Airmotive instrument shop has a complete department specializing in the overhaul of gyros. It is favored by pilots throughout the country who have found from experience that SAC-rebuilt gyro instruments are more dependable over long periods of time. Flyers appreciate the fact that SAC only uses rotors scientifically balanced *at the factory.* They also appreciate the price:

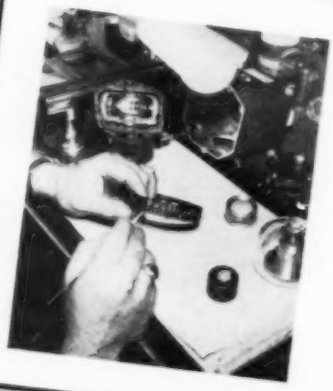
$32.50 for labor, plus parts, for directional gyro and gyro horizon overhauls.

Here are but a few of the many skilled, precision operations which combine to make a SAC gyro overhaul the FINEST overhaul available—

A DG rotor is lapped on a sensitive drill press, polishing the pivots to a smooth, high gloss.

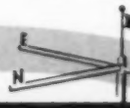
The rotor unit is centralized by the use of two of the many fine tools in SAC's gyro shop—the Universal fixture and the Last Word indicator.

Mounted on the Universal fixture, the gyro assembly is balanced before being installed in its case for calibration.



Dials are given an all-free touch-up with radium paint. There is a nominal extra charge if the dial is completely repainted.

Overhaul finished, gyros are placed on the Scorsby where they are subjected to a long and rugged simulated flight test to assure perfect operation.



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Just among ourselves

EDITORIALS

JET SUPREMACY AND THE NATIONAL AIR RACES

WATCHING America's jets streak to new international speed records, one experiences both pride and somber reflection. Even if you have seen fast airplanes come and go over a long period of years, you feel something completely new and different when you watch a powerful jet literally burn the air off its wings in a low-level turn. This, you reflect, is military performance at its best, forerunner of even greater performance to come. No less than this will be capable of withstanding modern aggressor forces—here it is, pridefully exhibited in the element which needs no superlatives or soap-boxing to be convincing.

So it seemed while watching the jets go by last month at Detroit, where military flying completely dominated the National Air Races except for the Continental Motors Trophy midget races for competing backyard designs.

Some among the ranks of aviation have condemned the National Air Races for appealing to thrill-seekers with flying so dangerous as to risk life and limb among spectators and residents of the nearby countryside. These misguided critics construe aviation in a strict sense as being "something to be sold to the public" only through safe and sane promotions such as static displays of aircraft where neatly-lettered signs identify models and makes and flunkies pass out handbills glorifying these makes and models in words and phrases. We have never yet agreed with this view. We believe that (a) the National Air Races as an annual event are an aviation institution staged for the primary benefit of aviation as a gathering place for aviation and as the one, principal place where complete safety control of racing is most feasible; (b) the public is more intelligent than some critics of racing believe, in that the public can distinguish between racing hazards and the factors of safety which air transportation has developed for progress through public patronage; and (c) the National Air Races as an institution have value to the nation as a necessary facility in the development of aviation performance and skills.

There were spectators in large numbers at last month's running of the National Air Races in Detroit—about 165,000 tickets were sold. But the principal audience was the millions of persons who learned from news reports that American military planes flying at Detroit had, among other things, established a new world speed record of 628.698 mph. around a 100-kilometer (62.137-mi.) closed course. This record had been held by Great Britain since 1948, when a stripped-down, specially-modified jet fighter had averaged 605.230 mph. around a closed course. The new American speed mark was made in a standard, production-model U. S. Air Force F-86 Sabre fighter. Planes exactly like it, carrying the same armament, pilot protection and fuel tanks, are fighting today in Korea with superior scores against Russian-produced fighters. Jet supremacy was the victory in Detroit won by Col. Fred J. Ascani of the USAF when he established the new international record in winning the Thompson Trophy race.

Performance other than speed was demonstrated by the jets. Another F-86 Sabre flew 1,919 miles non-stop from Muroc, California, to Detroit, in a mere 3 hrs. 27 mins. 56.4 seconds at an average speed of 553.761 mph. Thus the F-86 fighter exhibited its range capabilities.

Here is proof of U. S. aviation industry leadership for all the world to see—a fighter versatile enough to combine record pylon speed and maneuverability with 2,000-mile range while fully equipped for combat. It is more than a tribute to its builder, North American Aviation, Inc. It is a symbol of industrial aeronautical excellence, for the Sabre is not a one-of-a-kind laboratory prototype but a first-line combat aircraft which has been in assembly-line production for several years.

The 628-mph. figure which was the average speed of the Sabre in winning the Thompson Trophy does not represent the airplane's maximum speed. During this pylon race it actually hit a top of 680 mph. around the course. Two days earlier in trials, it reached 684 mph. All these speeds represent the Sabre's racing capabilities — not its straight-flight speeds. It has been flown faster than 700 mph.

Such performance speaks for itself among military councils of the world. It stands as a reminder of the American aeronautical industry's supremacy, and in this the performances at last month's National Air Races aroused not only national pride but international respect.

SAFETY IS A DOLLAR MARK FOR AIR TRANSPORTATION

SEVERAL years ago an article on executive flying in this magazine, written by Executive Pilot Fred K. Dick, coined a phrase. *Safety,* wrote our Author, *is a dollar mark.* Truer words were never used in application to flight safety—dependable air transportation comes from somebody's investment in quality of high standards. This quality costs money whether it is in an airplane, engines, propellers, instruments, radio, electronics, fire protection devices—yes, and of extreme importance—pilot judgment, which also represents a considerable investment when it meets air transportation standards.

This dollar aspect of air safety is best illustrated by the air carriers, which learned long ago that incompleted trips and breakdowns mean cancellation of schedules, which loses patronage. Aside from adopting highest possible specifications and quality standards for equipment and accessories, the air carriers insist most of all on adequate maintenance. They

(Continued on page 41)

Ignition Headquarters

. . . for PISTON, JET and TURBO JET ENGINES

Bendix experience extends to every phase of aircraft propulsion. For more than twenty-five years problems of ignition for every type of aircraft engine and operating condition have found their solution in the resources and skill of Bendix. That's why the aviation industry has come to consider Bendix the one source *uniquely qualified* to design and produce ignition equipment to meet every operating requirement.

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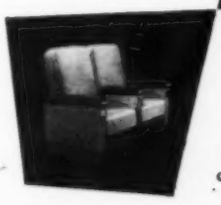

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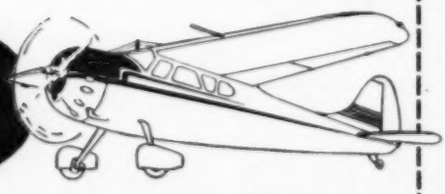

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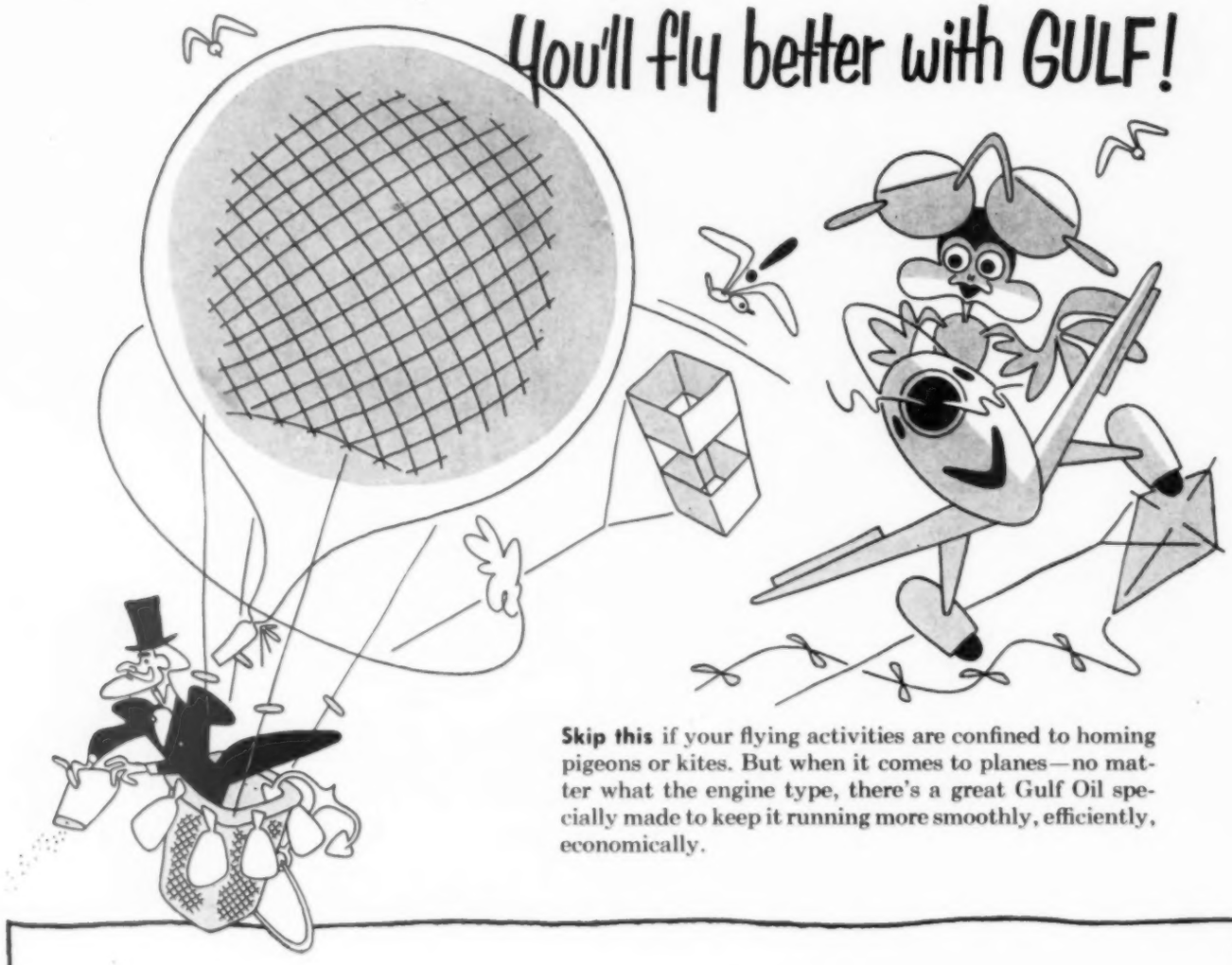

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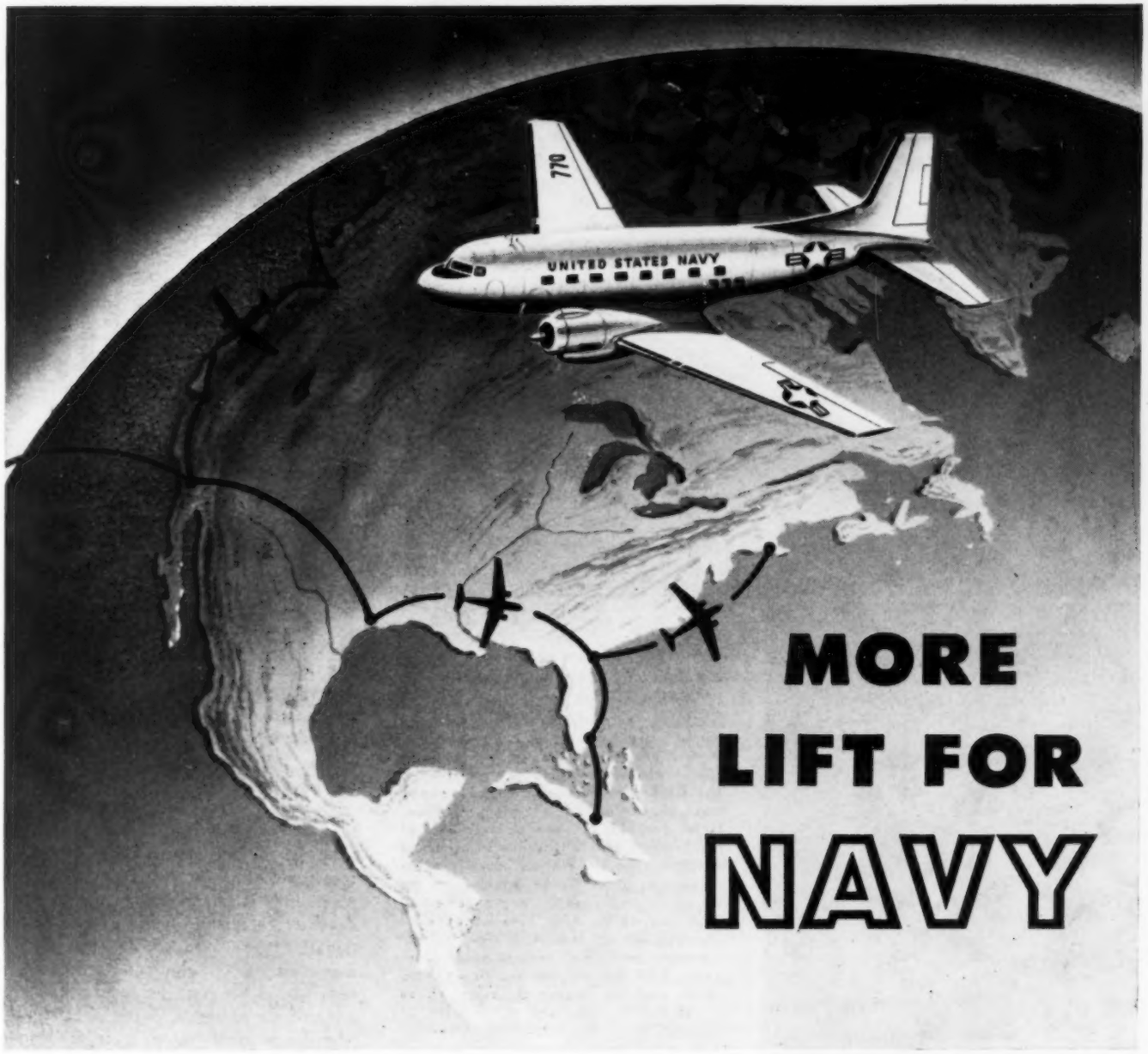

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With new swept-back wings, more power, greater speed, longer range and increased payload, the R4D-8 represents real economy.

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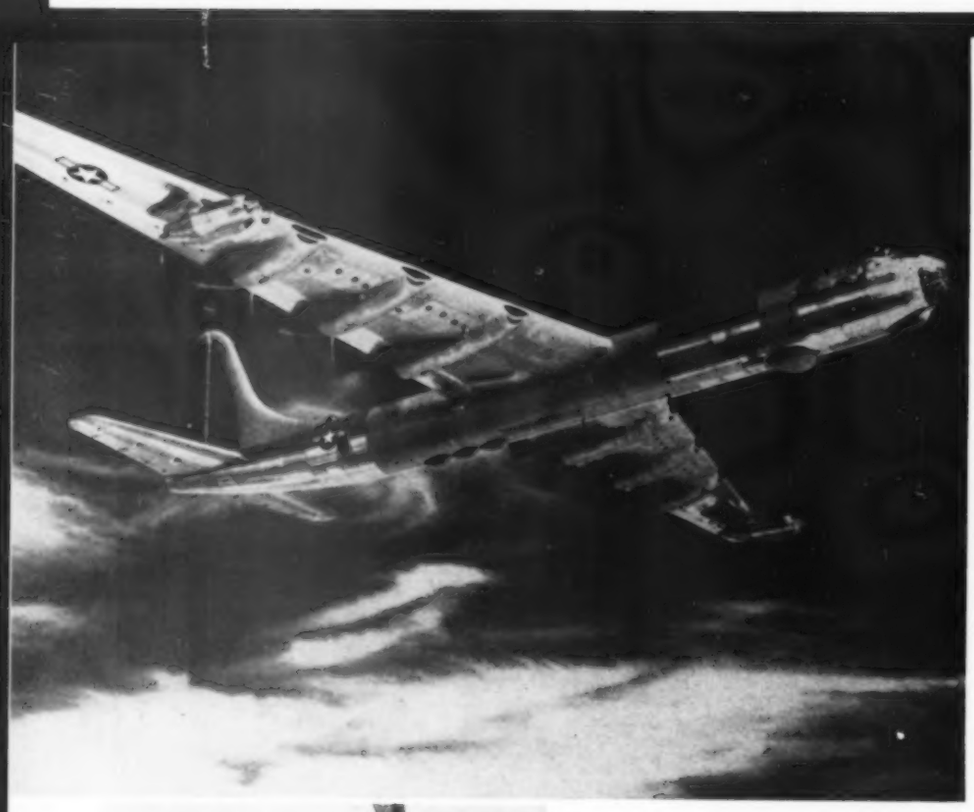


Aviation's

How the ceiling for

By TOM ASHLEY

Contrast in lighting is illustrated by the two flight photos above and below. Note top-lighting by sun's rays on B-36 below, photographed at lower altitude. The RB-36 (for reconnaissance) above was photographed at high altitude. Note darkness of sky above, lack of top-lighting due to absence of diffusion of sun's rays is rarefied, dust-free atmosphere. Most of the lighting on the RB-36 is underneath, being reflected from the earth. Also note absence of shadows. At left is B. A. Erickson, flight manager and chief test pilot of Convair's B-36 factory. He has flown more hours and for longer duration above 40,000 ft. than any other pilot.
—(Convair Photos.)

OVERCOMING hazards to man and machine found nowhere on earth, pilots and crews of America's biggest bomber, the B-36, are mastering the stratosphere's half-lighted, intensely cold and unnatural realm. It's a fantastic void 8 to 10 miles up where the B-36 operates best, with the airman constantly challenged by problems actually worse than laboratory research has encountered and with pressurized cabins always in the shadows of split-second death or certain injury in case of accidental exposure to the raw elements. But aviation's high frontier becomes less formidable with increasing knowledge of its demands. With B-36 flight experience now routine, it is being made a practical if awesome environment for crews and equipment probing its valuable secrets.

Why fly at incalculable risk above 40,000 feet? Because the stratosphere offers air transportation its maximum speeds per unit of power, its highest fuel economy and longest ranges, and its greatest competitive advantages. Translated into B-36 characteristics, stratospheric flight advantages may determine victory or defeat in a world at war—with American B-36 crews currently holding a greater edge over interception than that which gained far-reaching World War II air power victories.

Some of the obstacles encountered at very high B-36 altitudes and how they are being mastered can now be revealed by the man who has done more flying above 40,000 feet than any other individual and for longer duration. He is B. A. Erickson, manager of

High Frontier

for practical flight endurance has been pushed above 45,000 feet in five years of B-36 testing

flight and chief Convair test pilot at the Texas factory where B-36's are manufactured.

"At 45,000 feet you find things are only approximately as you had expected from all of the years of research devoted to altitude," says Erickson, who has personally had to reconcile these approximations with actual conditions ever since the original XB-36 made its first flight five years ago on August 8, 1946. (The interview upon which this article is based took place, appropriately enough, on the fifth anniversary of that flight.) "At 45,000 feet you can very rapidly become extremely burdened with errors greatly magnified by the altitude." (Erickson declined, for security reasons, to state how high he has been in a B-36, talking only in terms of "over 45,000").

What Happens at 106 Below Zero

Cold, for example, exceeds the minus 67 degrees F. "standard" usually expected. On a recent flight, Erickson's corrected outside air temperature was minus 106.7 degrees F. On the hot Texas airport below, the thermometer was 104 degrees above zero. From take-off to altitude, in a brief climb, he had taken the B-36 through a 210-degree spread of outside air temperatures.

Things happen to aircraft metal and equipment operating through such extremes. A B-36 wing, for one thing, shrinks as the temperature drops. Then it expands on the let-down to earth. This expansion and contraction has to be controlled—a B-36 wing has expansion slip joints which compensate much the same as expansion rollers on steel bridges.

Cables linking the B-36's control surfaces to the pilot's control column and rudder pedals must also be compensated.

Some of the engine controls are not so easily compensated. Control cables for these had to be eliminated and a complicated electronics system devised. A signal fed into such a system from the cockpit energizes a repeater mounted on the engine.

Temperature extremes also play havoc with lubricants. Engine oil exposed to minus 100-degree temperatures soon becomes a solid, resembling plastic or glass and having no lubricating quality whatever. Synthetic lubricants had to be developed possessing qualities exceeding those determined in ground laboratories.

Changing extremes of temperature also create destructive moisture inside of metallic equipment. This moisture soon causes corrosion, fouls up electronic circuits, and the equipment is ruined. The solution to this problem in the B-36 was hermetically-sealed equipment. Condensation of moisture in many areas of the B-36 has also led to the provision of convenient drain holes. Without them, water accumulation mounts surprisingly in an airplane of such large dimensions.

Sea Level Power in Stratosphere

Lack of atmospheric pressure and oxygen is the big problem which has delayed the probe of nearby space more than any other obstacle. But postwar engine refinements have made it possible for the B-36 to operate within safe limits far above the vicinity of 35,000 feet in which some World War II aircraft were flown for only short duration.

"The B-36 can now maintain maximum continuous power well into the stratosphere," says Test Pilot Erickson, in praising development of the big bomber's Pratt and Whitney reciprocating engines and their outsized superchargers. "We can not only climb to well above 40,000 feet, but we can operate up there for hours on end. And we can do this with our piston engines using a lean mixture."

His brief statement hides a multitude of technical refinements. Dual superchargers of the latest type are on each of the B-36's six piston engines. They compress air for the engine intake in quantities never before attempted on any piston-engine airplane. This high-altitude supercharging is the key to the B-36's stratospheric capabilities.

It is also the source of a major problem which had to be solved. Air is heated when it is compressed, and the air from B-36 engine superchargers skyrockets in temperature, shooting up from the minus 100-degree outside air temperatures to 400 degrees F. when it leaves the compressors for the engine intake. Cooling it down to practical levels for combustion involved more than ordinary problems. For one thing, the atmosphere above 45,000 feet does not absorb heat so rapidly or effectively as at lower levels. In other words, the rate of heat rejection is much less at altitude than at sea level, but the B-36's operation demands even faster rejection of heat than at sea level. Ingenious intercoolers accomplish it, rejecting 300 degrees of the supercharged air's heat so that it enters the engine intake at a relatively cool 100 degrees F.

Present-day high-tension ignition at altitude is subject to flash-over unless the ignition system is pressurized. But a better answer is the B-36's low-ten-

sion ignition. This is used on many airplanes which fly at much lower levels than the B-36, but it is especially valuable on the big bomber because of the large amount of complicated, king-size plumbing it eliminates from the six piston engines.

Other problems, peculiar to the B-36 alone, demand all the gimmicks and plumbing the engineers can pack into an engine nacelle while holding drag to a minimum. Crankcase and tank pressurization is needed, for example, to control engine lubrication. Oil froths if exposed to the low pressure of high altitude, and this results in loss of oil. It finds its way in rivulets back to the pusher propellers, building up blobs at the bladetips where it freezes and is hurled into space. Sometimes these frozen chunks of oil strike the fuselage. This damages the airplane and poses a safety problem—on one flight a chunk of oil from the prop tips pierced the communications tube which connects rear and forward cabins, causing loss of cabin pressure. Erickson says centrifugal force hurls the oil chunks from the blades at the velocity of a .45-cal. bullet, making the stuff as potent at shrapnel. Special techniques are followed to minimize oil dilution from moisture condensation due to temperature changes.

Unprecedented fuel economy is available, but power settings must be more precise than ordinarily used in airplanes. An error of 30 rpm. from careless power settings, for example, can mean several hundred miles of range. B-36's frequently fly non-stop, non-refueling missions lasting 40 hours, and on at least one test flight a B-36 flew for more than 50 hours. Fuel capacity is over 21,000 gallons, and with such quantities fuel loss through vaporization at altitude becomes not only measurable but a factor which enters into range calculations.

Convair is now building the YB-60, an advanced development of the basic B-36 design, with eight jet engines and sweptback wing. Because jet fuel does not vaporize as readily as the 145 performance number fuel used in the B-36, the YB-60 will not have to contend with this problem. But it will have other altitude difficulties which are not found in the B-36, especially in fuel consumption. In this the Pratt and Whitney piston engines on the B-36 are champion performers, consuming far less fuel per horsepower hour than much smaller engines.

The Deadly Threats of Altitude

Cabin blow-out and sudden loss of pressurization are the major hazards against which Erickson and his crews had to devise safeguards when beginning their probe of nearby space. B-36 cabins are pressurized at 7.5 pounds per square inch, and at 40,000 feet the cabins maintain the equivalent of 10,000-foot altitude. Here and higher crewmen must have instantly available such emergency equipment as facial pressure oxygen masks and their own portable supplies of oxygen. Moreover, they must possess the skills to use their emergency gear, which requires training and technique. Whereas the period of useful consciousness at 40,000 feet is 10 to 20 seconds, in which a crew man must protect himself in an emergency to survive the elements, he has but a fraction as much useful consciousness in the 45,000-50,000-foot zone. As time is measured, this is about the duration of a photographer's flash, or the snap of a finger. Death or certain injury can come in a twinkling to the high altitude airman who is unprepared for an emergency blow-out.

"It has never happened, but let's assume the cockpit canopy suddenly disappears and all cabin pressure is lost as quickly," says Erickson, explaining. "Immediately you are shot into the atmosphere because the difference between cabin and outside pressure is so great.

"Instantly upon exposure around 45,000 feet, you have to begin facial pressure oxygen breathing. This isn't easily done, because there is more pressure in your lungs than outside of your body. This pressure differential, while small, causes an expansion of the diaphragm. So you have to breathe in reverse, consciously contracting the diaphragm. It not only takes instruction and practice but it is a laborious process and very fatiguing. Simply making oxygen available to the lungs isn't enough. You can die at very high altitudes with your lungs literally swimming in pure oxygen. Before the oxygen can benefit the blood, it has to be forced under pressure into the lung tissues."

Assuming you survive this initial hazard and live to continue forced breathing, you still face additional problems. Falling at such altitudes, your body accelerates very rapidly and to extremely high true air speeds. If you pop open your parachute too soon, its opening at such velocities will cause a shock of something like 20 G's. Unless your neck and other parts are positioned precisely correct, this shock can cause instant death. Deadly frostbite would take its toll if you survived such an opening. So you wait for lower altitudes before opening your 'chute, but to do so you must calculate your rate of fall by some means.

It is noticeably darker near 50,000 feet, this being described by Erickson as resembling light conditions during a partial eclipse of the sun, to use an extreme example. Since there can be five or more layers of clouds between that height and sea level, you soon find yourself falling in complete darkness. Vision is useless, so you count off the seconds. This brings on apprehension, for below 20,000 feet some of the cloud layers might shroud mountainous terrain.

Such things have never happened to Erickson or his Convair test crews, but they never go to high altitudes without being prepared for them. Parachute improvements are reducing the hazards. These improvements include an automatic opening device which pops the 'chute when favorable pressures are encountered in the fall. Special flying suits offer warmth from heating elements to protect the airman's body in the subzero cold. Buck Rogers-like vacuum suits and glass helmets have been suggested to protect the lungs and breathing habits.

But perfection of safeguards is handicapped by the same problems which have hounded development of the B-36 as a mechanical device in the stratosphere. Rubber, for example, is useless above 45,000 feet, and so are many other conventional materials. Even some of those which have withstood many laboratory tests fail when

(Continued on page 39)

80,000 Lbs. Heavier, B-36 Now Grosses 358,000 Lbs.

IN five years of B-36 flying, the world's largest bomber has undergone far-reaching production changes and performance improvements. Gross weight, for example, has gone up from 278,000 lbs. for the original model to 358,000 lbs. for the current B-36F model, a 29 per cent increase. Power has been increased even more than weight. Early models were powered by six Pratt & Whitney Major piston engines rated at 3,000 hp. each for take-off. The current production model's six Pratt & Whitney R-4360-53 piston engines are rated at 3,800 hp. each for take-off. Piston power thus has jumped from 18,000 to 22,800 hp., an increase of 26 per cent. In addition, four jet engines have been added. Current B-36 models produce the equivalent of 44,600 hp. at certain speeds with piston and jet engines operating. Convair flight crews have made over 900 B-36 test flights since the XB-36 first flew, these adding up to more than 6,000 hrs. in the air. USAF flying is not included in these figures. ★ ★ ★

Super Cessna

A LARGER and more powerful liaison airplane being demonstrated to the military forces by Cessna Aircraft Company introduces Lycoming's big new flat engine rated at 375 hp. for take-off. Called Cessna's Model 308, it is said to be capable of delivering a payload of more than 1,000 lbs. a distance of over 800 miles.

Very much larger than Cessna's L-19 now being produced in large quantities for the military, the new model has a 4-pl. cabin. It appears as many as eight persons could get in so much space. Details were not released. ★ ★ ★

Exhaust augmentor tubes are featured on Cessna 308. These provide exhaust pumping for better cooling, eliminating cowl flaps. They also give added thrust. Prop is constant-speed Hamilton-Standard.
—(Cessna Photos.)

against which Erickson and his crews

easily done, because there is more pres-

Progress for

By BOB WEMPLE

THE impact of tricycle landing gear as a significant milestone of progress in lightplanes was first felt by private fliers long before W. T. Piper brought out his Tri-Pacer. But the Tri-Pacer has made it possible for this impact to be experienced by aviation's numerically largest crowd of customers—the people who fly Cub-type airplanes. At the same time, the Tri-Pacer has made it possible for this same "crowd" to combine the simplicity of tricycle-gear handling with 4-place lightplane capacity. In the process W. T. Piper makes available to them just enough speed to make the familiar Cub-type airplane suitable for cross-country transportation. And he does this with a good engine of comparatively small horsepower output.

That, to us, sums up the significance of the Tri-Pacer as we experienced it on a cross-country flight made as the basis for this article. To us the Tri-Pacer represents an important turning point for a considerable segment of aviation represented by the Piper Company itself, its widespread organization of distributors and dealers, and its large family of Cub users. With the Tri-Pacer all these people are on the threshold of greater utility, or usefulness, than was ever available in any Cub. The old reliable is taking on worthwhile performance to make it more than a trainer and if it can excel with performance as it has excelled in training it can ultimately offer what the lightplane industry seems to be getting farther and farther away from

We took off from Fort Worth late in the day, hurrying to make our destination before dusk. Thunderstorms kept us out of the airmen's resort at Possum Kingdom Lake, so we went into Abilene.
—(FLIGHT MAGAZINE Staff Photo.)

Piper People

—airplane usefulness at prices which greater numbers of people can afford.

But at the moment even Piper seems farther away from ordinary people and their pocketbooks than he should be. We say "appears" because $6,000 to $7,000 for a Piper is something new, something people never expected. It all depends on who you are, how you use an airplane, and how you value your 1951 dollars. To some, a dollar is a dollar regardless of the date while to others a 1951 dollar is worth only half its 1939 value, or even less. Your tax bracket also has something to do with it, because we know some people who spend 10-cent dollars for airplanes and have very little fault to find with such things as the current tariffs of flying your own.

Even if it isn't Cub-like in price, the Tri-Pacer is a true Piper in other respects. Especially is this true regarding the airplane's simplicity and most of its flying characteristics. The exception in handling is in landing. With a full load, it is really through flying when you put it on the ground. But this is all right because you have that wonderful simplicity of nose-wheel handling. You soon learn to bring the Tri-Pacer in with a little extra speed on account of it. Then you find there is nothing to a landing.

Such simplicity is a boon to Cub distributors and dealers in several ways. For example, it makes for a better volume of airplane rental business. Jack Robinson, Piper distributor at Fort Worth, Texas, has more rental business with two Tri-Pacers than he ever had with conventional Pipers.

"In the first place I can afford to let people take out a Tri-Pacer when I would actually hesitate to let them take out a tail-wheel airplane," says Jack. "In the second place a lot of rental customers feel they can handle a Tri-Pacer better than a tail-wheel airplane and therefore have more confidence in their flying ability. As a result, they want to fly more and I want to let the airplane go out more often."

When a rental customer turns up at Jack's office, about all it takes to be convincing is a hop around the field. Even if the customer needs to shoot two landings, it is still a lot simpler and less expensive than checking him out in a tail-wheel airplane he's not used to flying.

"As for prospective flying students and prospective buyers, I always seat them on the left and tell them what to do to start the airplane rolling," says Jack. "They make the take-off while I talk them through it and they also do the flying while I talk them through it. Now and then I have to help on the first landing, but not often. There isn't much they can do wrong in such a demonstration. This is a tremendous confidence builder, and the prospect always reacts favorably."

We believe that any airplane which accomplishes this has worthwhile value to the flying business. It is exactly what the Cub organization has needed and the success of the Tri-Pacer has meant revival of sales and student instruction.

While Robinson has two Tri-Pacer demonstrators, we had to wait over a month before one was available for this article. His Tri-Pacers were just too busy. We could have had it sooner but we did not want to take it out of town as long as there was a chance

(Continued on Page 28)

Several Pacers stopped at Odessa for fuel while we were there. Only other flights to come through were a Twin Beech, a Piper Super Cub with spray rig, and a Luscombe.

—(FLIGHT MAGAZINE Staff Photo.)

545 Miles

THREE years ago a young soaring enthusiast and ex-Pan American Airways co-pilot began building a sailplane around some high-performance ideas which had defied far more experienced engineers and craftsmen. Last month the sailplane, into which had gone uncounted hours of tedious paper work and over 5,000 hrs. of laborious construction, won worldwide fame when its builder, 28-year-old Dick Johnson, flew it 545 miles for a new international distance record for sailplanes, topping a Russian record which had remained untouched for 13 years.

"There isn't a cleaner aircraft in existence anywhere," is the way one top-notch soaring authority described Johnson's sailplane, the RJ-5. "Young Johnson has demonstrated in the air a degree of flight perfection never achieved by anybody. The RJ-5's flight is an amazing performance from

World's finest sailplane—that's Dick Johnson's RJ-5, shown above with its owner and below being assembled in the hangar at Odessa, Texas. Its 545-mi. flight copped a 13-yr. distance record from Russia.
—(FLIGHT MAGAZINE Staff Photos.)

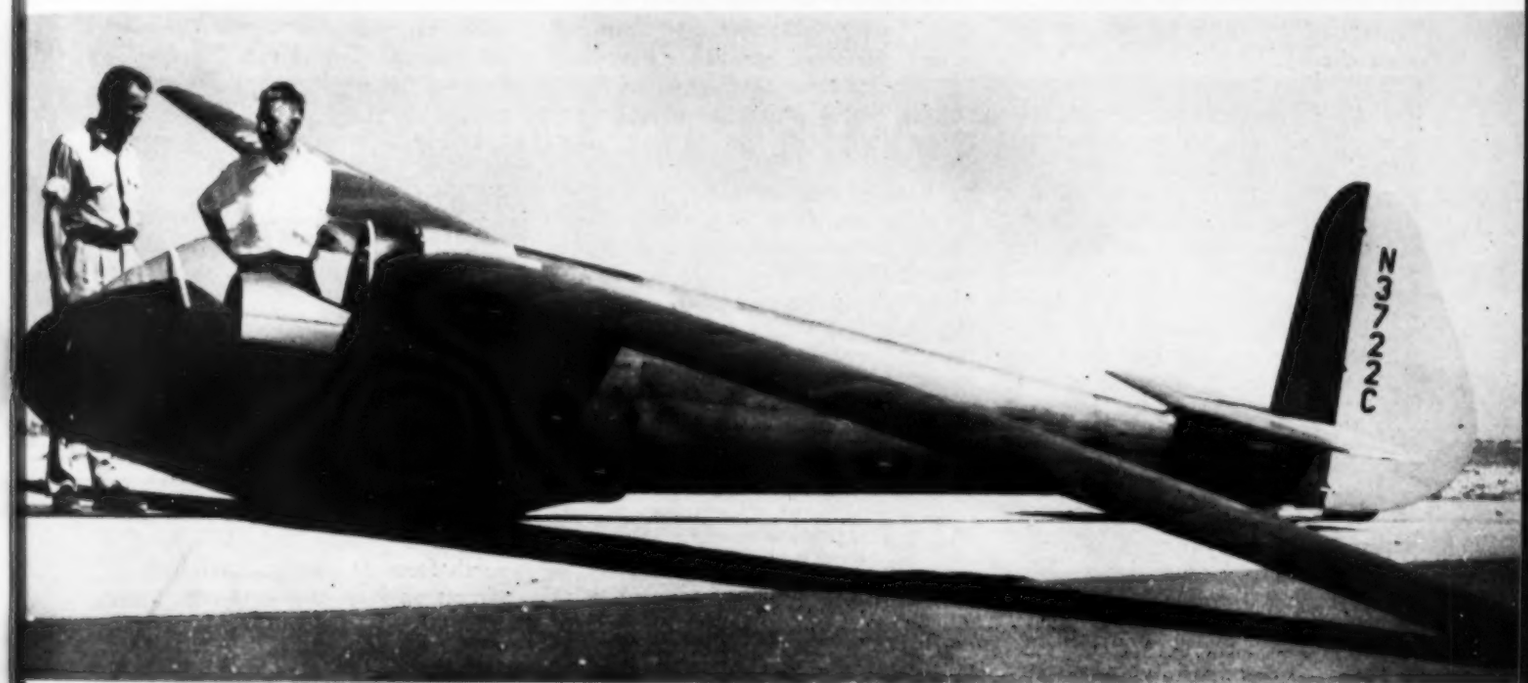
to Beat the Russians

any angle you view it, one which has won the admiration of all who are interested in aerodynamic refinement and soaring."

No less a tribute could be paid to the RJ-5, which has the following technical superiorities:

Glide Ratio—40 to 1.
Rate of Sink—1.75 ft. per sec.
Wing Profile Drag—.0065 (per-

RJ-5's metal wing has laminar-flow airfoil. That's President Jon Carsey of Soaring Society of America with Dick Johnson below and studying chart of his flight (above). —(FLIGHT MAGAZINE Staff Photos.)



Dive brakes of large area on underside of wing give effective glide and speed control to the RJ-5. Air intake is in small hole at nose. Wing span is 55 ft. Skid is to be replaced by retractable device, reducing drag.
—(FLIGHT MAGAZINE Staff Photo.)

centage of drag of a flat plate of the same chord).

Even more importance is given to the RJ-5's performance by the fact that the aircraft utilizes a laminar-flow airfoil with more success than any similar airfoil has ever achieved. Because of its exacting demands for absolutely smooth wing surfaces, the laminar airfoil has been considered impractical by many aircrafters. Johnson has not only made it work satisfactorily—he has obtained such excellent performance that he is convinced it is superior to conventional airfoils at both low and high speeds. But more about the airplane later.

Johnson's record-breaking distance flight was made on August 5 from Odessa, Texas, during an officially-sanctioned special expedition to West Texas by a handful of some of the nation's leading soaring pilots. It was sponsored by the Texas Soaring Association with Soaring Society of America approval so that any records made could be internationally homologated.

Soaring conditions were found to be ideal almost as soon as the expedition launched its first flights from the Ector County Airport at Odessa. On July 27, Johnson had soared 420 miles in straight-line distance to exceed the existing U. S. distance record of 367 miles which he had established only a few weeks previously during the National Soaring Contest at Elmira, N. Y. But August 5 found conditions even better. The day before, Howard Klitgord of Rochester, N. Y., had soared 350 miles from Odessa in a Schweizer 1-23, which the RJ-5 had been outperforming for a year. Even a TG-2 went 200 miles to a goal.

August 5 dawned with promising weather for thermals, with Dick Johnson and his RJ-5 all ready to go. By 9:30 the giant smoke which plumed over the plains from a distant carbon-black plant presented a sky-picture better than any weather map as a local wind indicator and adiabatic chart. Flattened out like a haze-line, it soon gave way to small, rising bubbles of heated air and the ground crew knew these were the morning's first thermals.

Rushing into the air at 10:10 a. m. with a tow from a Stearman flown by E. J. Reeves, president of the Texas Soaring Association, Johnson forgot to set his barograph and cut loose from the tow at 1,500 ft. to land and start over. Twenty minutes later Reeves towed him up again. The tow had climbed only briefly when Reeves felt three distinct thermals at about 1,800 ft. In the fourth thermal, Johnson cut loose, about 2,000 ft. over a point about 2 miles West of the airport. He banked the RJ-5 sharply and in no time had ridden the thermal up to 3,000 ft., striking out from there on the heading along which the carbon-black smoke was scudding.

How the Flight Was Made

According to the modest Johnson, it was duck soup all the rest of the 545 miles during the 8-hr. 51-min. sailplane flight. But a study of the elevation chart traced by his barograph filled in the details for Jon Carsey, president of the Soaring Society of America, who was there to officially observe all record flights.

"The barograph shows Johnson's first hour was the hardest as he felt his way along, calibrating all factors to determine his best flight plan in keeping with conditions such as time, winds, altitude, speed, distance, and meteorology," said Carsey, who reviewed the barograph tracing later with Reeves and Johnson. "But by noon Johnson was working everything pretty smoothly, as if he already had everything solved with all factors dropping into place exactly as they should."

After the first 3 hours, the tracing showed the RJ-5 had sped through many big thermals without wasting any time for more altitude. Apparently Johnson always had a thermal when he needed it, for the spacing of his climbs became wider and wider as the flight sped across country.

For as much as 30 or 40 mins. he would cruise with the nose down, building up speed instead of climbing. Most of his flying was between about 11,000 ft., which was the base of the scattered clouds, and 7,000 ft.

There was a noticeable weakening of thermals during the flight's last two hours. But where he dropped some speed, he could pick up more and more altitude toward the end. How this was utilized was best shown by the barograph tracing of the flight's last glide. It was a gradual, unbroken slant to earth from 11,000 ft., stretching for almost an hour and covering at least 90 miles of distance on the ground. Then near the very end of the slant, the trace steepened before flattening out and ending—Johnson's final flare-out for the landing.

He landed at Sky Village Airport, Salina, Kansas, at 7:21 p. m., having been in the air since 10:30 a. m., the time of his release from the tow at 2,000 ft., just west of Ector County Airport at Odessa, Texas. The straight-line distance between was measured as being 545 miles but must be homologated in great circle mileage for the international record, and this measurement might be slightly different. But it was far more than enough to shatter the 13-year Russian record established by a woman, one Olga Klepkova, who cut loose from a tow at an altitude of better than 20,000 ft., and sailed 467 miles.

Returning to Odessa (his ground crew was half way to him when he landed), Johnson decided he wasn't flying any more during the expedition but would now ground-crew for others so they could enjoy the condi-

(Continued on Page 30)

The PIPER PACER'S Cross-Country Performance—

"Our Piper's a paying proposition," says G. D. Murray, Drilling Supt. of the Big Chief Drilling Co., Natchez, Miss. "I average 2000 miles a week and am cruising 135 mph with controllable prop. Our Piper's paid for itself many times."

Learns to fly in a day and a half! Mrs. Jeanne Voltz, Miami housewife, soloed the Tri-Pacer the morning after her first lesson. Tri-cycle landing gear and interconnected controls make it easy for anyone to learn to fly the swift, four-passenger Tri-Pacer.

Businessman, Lester Skinner, President of Skinner Salted Nuts, Bergenfield, N. J. learned to fly a Pacer last fall, had his license four weeks later. He finds his new Tri-Pacer "less expensive to run than a car . . . a great asset to my business."

Flying Ease and Economy of Operation Produce—

Across the Atlantic to Switzerland and back plus a nonstop flight from Los Angeles to New York! That's why Max Conrad of Minneapolis says, "The Piper Pacer is a remarkable cross-country airplane with economy and dependability which makes it ideal for farm or business."

"Easiest plane to fly I've ever owned," says LeRoy Getting, prominent cattleman of Sanborn, Ia., shown here with Mrs. Getting. Like many farmers and ranchers, Mr. Getting prefers the Pacer's economy of operation, load-carrying ability and easy, restful flight characteristics.

Winner of three major European efficiency races, the Piper Pacer outclassed all other types of personal aircraft. Flown by R. E. A. Goemans of Paris (second from left) the Pacer led field of 55 planes at the International Air Rally of Paris; won also at Champagne and Angers.

Hundreds of Enthusiastic Pilot Comments

Talk to any Piper Pacer owner and you get enthusiastic reports on speed, comfort, short field ability, and flying ease all combined with unbelievable economy. Price-wise, performance-wise, there's nothing to compare with this remarkable cross-country airplane. And in the Pacer or Tri-Pacer you get these important exclusives—nonflammable Duraclad finish, the dependable Lycoming 125 hp engine, and separate front and rear doors. Take a demonstration flight and see for yourself. For free Pacer brochure write Dept. F-9.

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Lock Haven, Pennsylvania

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Carey Mize	Crockett
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Southwest Airmotive Company	Dallas
Glen Lakes Aviation Company	Dallas
North Texas Aviation Company	Denton
Hall Flying Service	Eagle Pass
Farm Air Service	El Campo
Falcon Aviation School	Falfurrias
Pecos County Airways	Fort Stockton
City of Fort Worth	Fort Worth
A. C. Flying Service	Galveston
Garwood Aviation	Garwood
Emmett Flying Service	Genoa
John A. Jackson	Goldthwaite
Graham Aviation Service	Graham
Greenville Majors Aviation	Greenville
Cliff Hyde Flying Service	Houston
Sky Travel Inc.	Houston
Southern Sales & Transportation Co	Houston
Kerrville Flying Service	Junction
Kerrville Flying Service	Kerrville
Moyer Flying Service	Killeen
Frank Hogg Airport	Lameso
Liberty Air Activity	Liberty
Lubbock Aviation Company	Lubbock
Lufkin Flying Service	Lufkin
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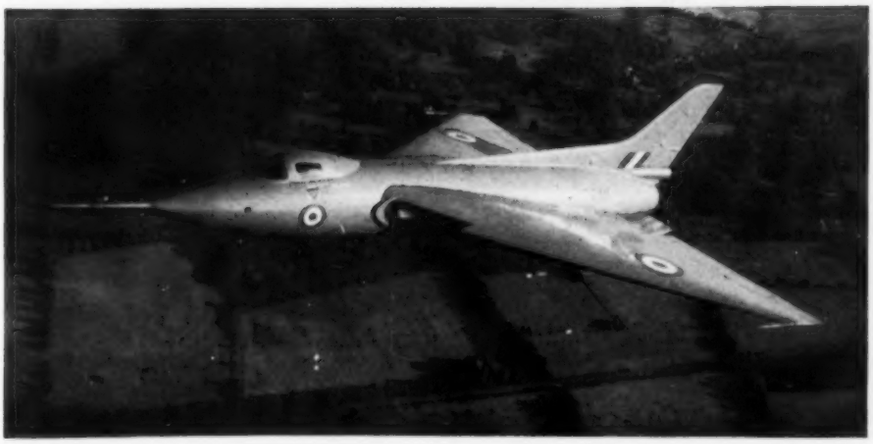
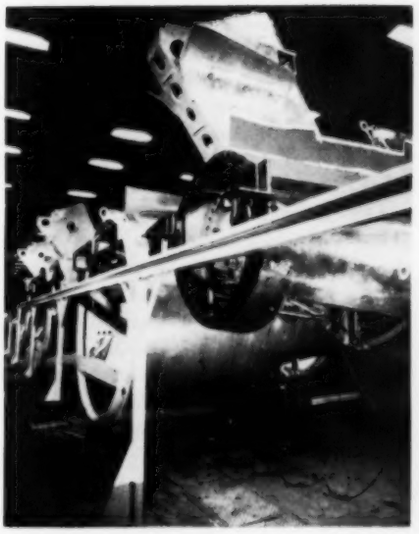
Jefferson County	Port Arthur-Beaumont
Bob Tanner Aviation Services & Supplies	Port Lavaca
Gorman Fox	Raymondville
Fancher Air Service	Refugio
Lane Airpark	Rosenberg
Saginaw Airport	Saginaw (Ft. Worth)
Davis Airport	San Antonio
Howard Aero Service	San Antonio
Monroe & Witt Flying Service	San Antonio
Schneider Flying Service	Seguin
Smithville Flying Service	Smithville
Jones & Ogden	Stowell (Winnie)
W. J. Worsham	Taft
The Taylor School of Aeronautics	Taylor
Reed's Air Service	Temple
Gulf Coast Airport	Texas City
Bauch Airport	Velasco (Freeport)
Zim-Tim Sky Ranch	Victoria
Wharton Flying Service	Wharton
Stoddard Aero Service	Wink

flight pictorial



BRITAIN'S LATEST transonic research aircraft is this Avro 707A, powered by a Rolls-Royce Derwent jet engine. The delta-wing has a span of 34 ft. 2 ins., and length of 34 ft. 4 ins. Braking flaps are on both top and bottom surfaces of the wing.
—(Society of British Aircraft Constructors Photo.)

TEMCO VERSATILITY is illustrated by the experimental Buckaroo gunnery trainer below and the elevated production "track" for B-47 Stratojet components shown at right. The trainer mounts ten 2.75-in. rockets and two .30-cal. wing-mounted machine guns. Elevated track at right eliminates scaffold stands for installation of equipment in Temco-built B-47 rear fuselage sections for Boeing.
—(Temco Photos.)



LOCKHEED SUPER CONSTELLATION is 18.4 ft. longer than previous model, designed to accommodate 47 to 93 airline passengers or 110 as troop transport, is powered with four 2,700-hp. Wright engines and is designed to take prop-jets for 400-mph. speeds. More than 60 have been ordered by Eastern, TWA, KLM, Pakistan and Air France airlines in addition to military models going to Navy and Air Force. Note square windows instead of Connie's customary round ones.
—(Lockheed Photo.)

PIPER TRI-PACER

(Continued from Page 21)

of rental by a student or customer. Two or three times we had a trip all set up but had to cancel when somebody showed up needing the demonstrator. Finally there came a mid-week lull when Robinson called us and said the ship was available "if we hurried." We did, getting out of town just before dusk and heading West to see what Mr. Piper's Pacer could do.

Three of us and our baggage and full tanks took out of Meacham Field, timing the trip off at 5:57 p. m. We were headed for Odessa, 301 miles away, but would spend the night at Possum Kingdom Lake's island resort for airmen fifty-odd miles out rather than swelter in Fort Worth. Getting a right turn out from the tower to cut it short, we were climbing at 100 mph. for distance when a B-36 showed up several miles out on our right wing. He was making an approach for Carswell Air Force Base just below our left wing. Having observed the high speeds of these mammoth airplanes from close range before, we hoisted the Tri-Pacer's nose to give the B-36 plenty of room. That slowed us but gave us 4,000 ft. in no time while the B-36 rolled to a stop less than 3,000 ft. from touchdown on the runway.

Lowering the nose, we picked up our heading and cruised the Tri-Pacer at the 2,450 rpm. recommended by Distributor Robinson. Our indicated cruising speed was 116 mph., which figures out to be something like 125 mph. in corrected true air speed. Then we got to looking around the cabin and making ourselves acquainted with the airplane, having rushed into the air to beat darkness without taking any time for the usual look-see.

Up front, we found we could settle down into comfort never before experienced in Cubs. There are two seats up front and they are not jam-packed against one another. There is actually a little room between them. Also, they have comfortable backs and are upholstered surprisingly well. They are not folding seats, either, and this makes for more comfort. The Tri-Pacer has two doors, one on the right for front-seat occupants, a rear door on the left for the back-seat occupants. This is one of the smartest cabin door arrangements ever made on any airplane and adds greatly to the Piper's usefulness. For example, it makes loading and unloading of packages or light cargo very easy. A nifty, full-length ambulance litter is available and loading a litter patient is simplicity itself, there being no wing to walk up on before jockeying the litter around a corner to fit it inside a single door as handicaps some low-wing airplanes. Our friend on the rear seat said he found it comfortable with plenty of leg and head room.

It was a hot August day and we found the sliding window panels excellent to control cabin air ventilation. The main windows consist of two sliding panels on each side of the cabin. Open the forward panels and cabin air is pulled out, while air floods in through the rear panels when they are open. But adjusting the openings, you can establish a variety of ventilation choices.

By the time we got to Possum Kingdom Lake, cumulo nimbus which marked a weak cool front to the North changed our minds about going into the island for the night. We decided to make Abilene farther West where we could substitute an air-conditioned hotel room for the lake breezes at night and where we could store the Tri-Pacer inside a hangar instead of parking it under a mesquite tree.

As late as it was, we decided against getting any altitude as Abilene is only 137 miles West of Fort Worth. So we stayed at 4,000 ft., and landed at 7:07 p. m., 1 hr. 10 mins. from take-off. This gave us a ground-to-ground average speed of 118 mph. Having the left tank topped, we figured our fuel consumption from the 12 gals. it took and averaged it out at 10.3 gals. per hour. If we could have climbed for some altitude where we could have leaned out the mixture, we could have beat this.

Next morning, we were off the runway at 7:05 a. m. and headed for Odessa, 164 miles to the West. Climbing to 8,000 ft., we cruised out at an indicated air speed of 110 mph. and a true air speed of about 130 mph. with 2,450 rpm., landing at 8:38 a. m. with a ground-to-ground average speed of 106 mph. through a quartering headwind. It took 14 gals. to top the tanks this time and this averaged out right at 9 gals. per hour.

Three or four other Pacers turned up at Odessa as we chatted with Johnson before returning to Fort Worth on our inbound leg. One was a Tri-Pacer with four big men in it. They were headed across the West to the Coast on a business trip. Another had two women pilots from Memphis, Tennessee, headed for Santa Ana, Calif., and the start of the annual female air derby. When we were taking off, we saw another Tri-Pacer letting down for a landing. Mr. Piper's little 4-place is really a popular airplane across the country. The only other two air-

(Continued on Page 37)

Lockheed

SETS PACE IN CARGO FIELD

Look to Lockheed for the first cargo transport designed purely for turbo-prop power. It's the new L-206—answer to the U. S. Air Force request for greatly stepped-up range combined with speed, capacity and loadability.

Designed in 5 months the L-206 was the competition winner among 5 manufacturers. Far exceeding minimum specifications, it features numerous Lockheed innovations: a new streamlined full-rear opening for air drops... a pressurized cabin . . . clean interior, free of interfering protuberances . . . uniform tie-down fittings . . . integral loading ramp. The L-206 will have power conveyors in its truck-high floor, only 45" off ground.

What's going on at Lockheed?

Lockheed will whack into a billion dollar backlog when production starts in the newly opened plant in Marietta, Ga., now being tooled for the B-47 jet bomber. In Burbank assembly lines are being mechanized once again for faster jet production. New employees are being hired at the rate of 550 per week. Extensive plant expansion is now under way, including augmented facilities for advanced research.

What's being said about Lockheed?

NEWSWEEK, June 25, 1951: "Indeed the (Lockheed) F-80, the Air Force's first jet, has been the workhorse of Korea and has flown half the 100,000 fighter sorties..."

AMERICAN AVIATION, July 9, 1951: "Constellations are now earning C&S (Chicago & Southern Air Lines) over 14c per plane mile before mail pay. Equipment reliability has been exceptional."

AERO DIGEST, June, 1951: "The Constellation, even after 12 years of life, is not now nearing the end of its cycle but is only on the edge of a virtually new era. When a company can produce an airplane for which it has a backlog of future production of 139 (April 1) units after 12 years, you know that that company has accomplished a major miracle of technical foresight, and that is, without flattery, the accolade of the Lockheed Constellation, one of the truly great airplanes of aviation history."

Leadership demands constant achievement

Every 80 minutes

a Lockheed Constellation sets a new record for dependability!

Over 30,000 times the *dependable* Constellation has crossed the broad Atlantic... setting a record of *more crossings than all other modern airliners combined.* And every 80 minutes a Constellation repeats the performance, piling experience on experience.

Twenty years of Lockheed leadership back every Constellation. Next time you fly, overseas or at home, go by *experienced* Constellation.

DEPENDABILITY IS A 20-YEAR TRADITION—dramatically illustrated today by the Lockheed F-80 *Shooting Star*... which has flown more Korean combat sorties than all other fighters combined.

MORE THAN SKIN DEEP—Stripped down, each airplane reveals the quality behind Lockheed dependability. Its thousands of precision parts are tooled to microscopic accuracy... a tribute to painstaking research, engineering, production.

Lockheed

AIRCRAFT CORP., BURBANK, CALIF.

Look to Lockheed for Leadership

One of many RJ-5 design superiorities is positive rake wing tip featuring rounded leading edge, squared trailing edge. It reduces drag from tip vortices in flow. —(FLIGHT MAGAZINE Staff Photo.)

545-MILE FLIGHT

(Continued from Page 24)

tions. "I've done what I set out to do and I'm happy," the hard-working young engineering student explained. No known sailplane here or abroad has the performance characteristics to beat his new record anyway. He expects to better his distance by a hundred miles or so one of these days.

Capable of talking engineering fine points which few pilots can match for accuracy and detail (he has literally measured and calibrated factors which others estimate by theory), young Johnson says he could have made his flight with 1 per cent less drag. "That would have carried me 25 miles farther," he said. "I figured it out on the way back."

Proving the Laminar Airfoil

Commenting on his flight, Johnson said: "It's the wing that did it—a wing with laminar airfoil, an airfoil which I am convinced is superior to conventional airfoils at low or high speeds."

Some authorities have discounted the laminar airfoil, especially because of its undesirable low-speed characteristics. The absolutely smooth wing surfaces which it demands are believed impractical. What Johnson has achieved is the perfect wing surface for laminar flow. His is a wing unmarred by waves, humps, joints, rivets or even microscopic unevenness. This he has done with the RJ-5 even without paint or wax—Johnson has never painted the wing and it has the dull appearance of neglected weathering and sloppy attempts at cleaning. This appearance is deceiving, for the construction is so perfect the wing doesn't really need a gloss.

It is a metal wing, flush-riveted and finished off with ordinary lacquer filler bought at the auto supply store. For the technical-minded, it has an unusually high aspect ratio of 24.5 and slight sweep forward. Span is 55 ft. and area is 123.5 sq. ft. Dihedral is 2.5 degrees. Two main spars of dural are located at 20 and 50 per cent of the chord and an 032-gauge skin covers them and the leading edge. Aft of the rear spar, wood ribs are used, spaced 6 inches apart and fabric covered. Wing thickness is 15 per cent all the way from root to tip, tapering in plan form only with a high taper ratio of 3.5. Maximum coefficient of lift is 1.34.

Minimum Drag, Maximum Distance

Carefully measured, wing profile drag is placed by Johnson at .0065. This compares, for example, with .012 for that of the wing on the popular Laister-Kaufman sailplane. Johnson expects to reduce it down to .0060. "With that, I can add another 100 miles of distance," he said.

These technicalities can be translated in flight to performance never achieved in a sailplane. For example, the RJ-5's glide ratio is 40 to 1 at 50 mph. indicated air speed. From an altitude 2 miles above the ground, it can be glided 80 miles in still air. If that seems fantastic, consider this: When passing over a landing spot with 70 mph. and only 250 ft. of altitude, Johnson can make a pattern taking him one mile out and still return to that landing spot. He has done it many times in still air and without assistance, performing this on mornings before wind and heat develop.

Minimum rate of sink of the remarkable RJ-5 is a mere 1.75 ft. per sec. This is at 46 mph. It means Johnson can build up speed without sacrificing altitude. A year ago it was 2.5 and considered excellent, along with its glide ratio which was then 31 to 1. Refinements which he has accomplished in both of these are examples of the thorough-going aerodynamic skills with which the young airman is working.

Johnson originally commissioned Harland Ross, the well-known sailplane designer, to build the RJ-5 (for Ross-Johnson). The laminar airfoil was suggested by a friend, Dick Lyon, a Hughes Aircraft engineer. Johnson is also indebted to another friend, Stan Hall of Northrop, for his stress analysis and spanwise lift distribution calculations. Many other friends and soaring enthusiasts contributed their skills, especially Dr. Raspet at Mississippi State College's Engineering Research Station. Johnson entered this college after commissioning Ross to build the RJ-5. By the Winter of 1949-50, Ross had spent 2,200 hrs. on construction but agreed that the craft should be completed at the Mississippi school where so much assistance was available and where Johnson himself could work on the sailplane.

Four bolts in machined dural fittings join wing to RJ-5 fuselage, as illustrated by this close-up. Each wing panel weighs just under 190 lbs. Total aircraft empty weight is less than 500 lbs. Over 5,000 hrs. of labor went into RJ-5's construction. Dick Johnson is a senior aeronautical engineering student at Mississippi State College, will take post-graduate course at Stanford University. —(FLIGHT MAGAZINE Staff Photo.)

His first flights were in the 1950 National Soaring Contest near Dallas. Since then he has modified the RJ-5 considerably, eliminating "spoilerons" and lift flaps, for example, because he found them unnecessary. Empty weight is now 472 lbs. The fuselage is plywood.

As near perfect as the RJ-5 is today, Johnson says it will be two more Winters before he is fully satisfied with it. Meanwhile, he is starting a project with a sailplane having 89 or 90 ft. of span as compared to the RJ-5's 55 ft. This will be for high altitude, Johnson having conquered distance. It will be a two-seater. Important developments such as pressure cockpits can be studied with such a project.

He isn't worried about extending his distance record soon. Let others shoot at it. If they get close, he believes he can extend it safely enough. "Anybody can build the same performance," says the youthful champion. "But they'll have to do a lot of work and it won't be easy." ★ ★ ★

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REED RELIABILITY

. . . is assurance of top performance under all conditions.

Dependability in flight depends on perfect functioning of engines, instruments, radio, electrical system, hydraulic equipment and many other components too numerous to mention. But your aircraft in flight can only be expected to perform in keeping with the quality of the attention it has received on the ground.

You are never in doubt as to the dependability or reliability of your aircraft when you avail yourself of the specialized service and extensive maintenance facilities of the J. D. Reed Company. Twenty years of experience, based on exacting standards and precise specifications, has placed this company far ahead in engineering and technical knowledge.

You pay no more for our achievements in perfectionism, but you receive countless hours of enjoyable trouble-free flying with confidence in the unquestioned dependability of your aircraft through the unfaltering high standards of the J. D. Reed Company.

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Reed reliability—day after day, year after year—is recognized by those who accept only the best. Significant of this is the fact that so many of the nation's leading firms and businessmen depend on the J. D. Reed Company for all their aircraft needs. We have built a superior sales and service organization equipped to handle the most complex aircraft problems in the least amount of time and most economical manner possible with delivery on time — every time.

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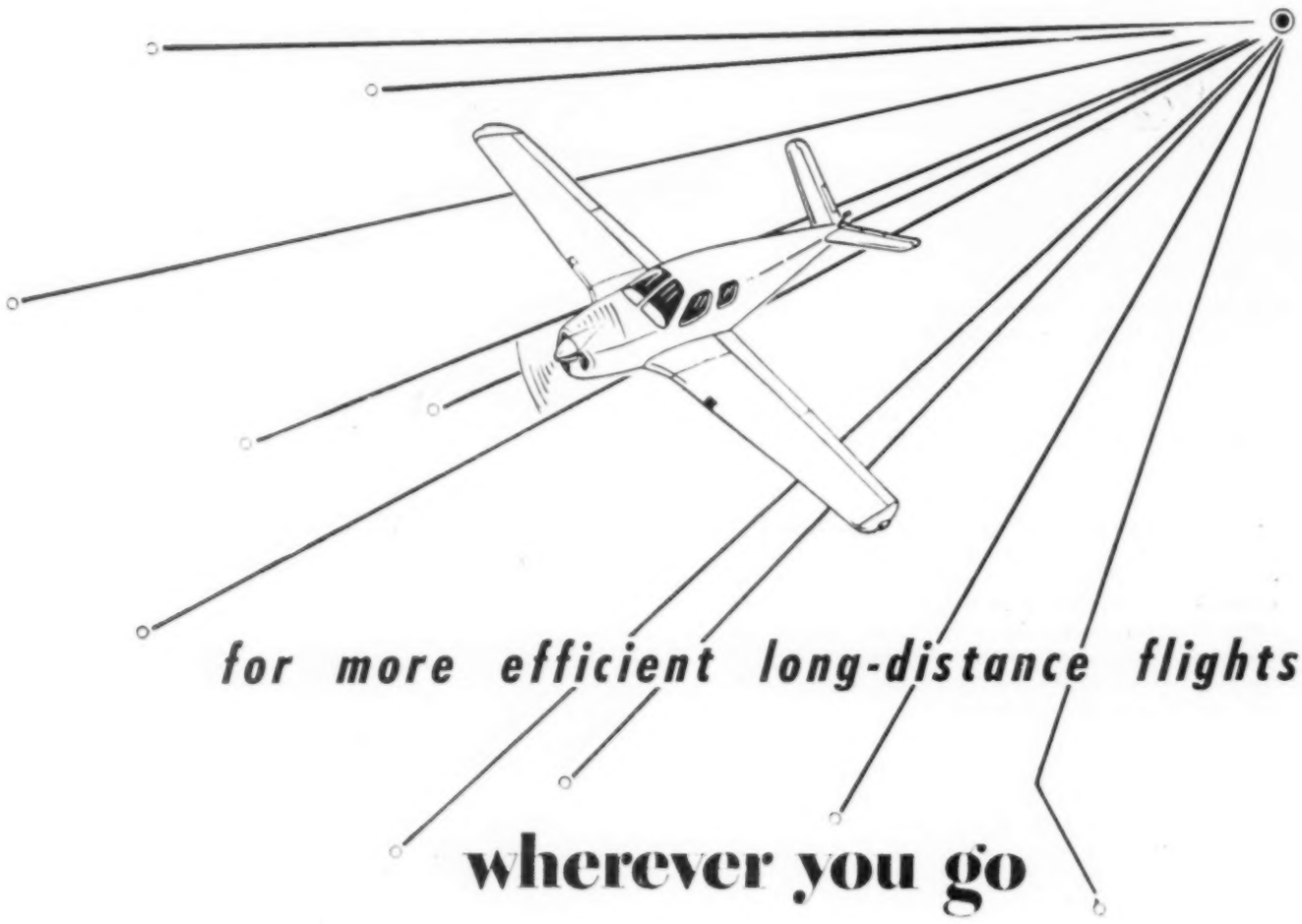

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Truax Field
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Atlantic Aviation Service
New Castle County Airport
Wilmington, Delaware

Atlantic Aviation Corp.
Teterboro Airport
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Butler Co., Aviation Division
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Currey Sanders Aircraft Co., Inc.
Downtown Municipal Airport
Shreveport, La.

Francis Aviation
Capitol City Airport
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Gray Aircraft Svc. Co., Inc.
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Love Field, Dallas, Texas

Harte Flying Service
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Hunter Flying Service, Inc.
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Ohio Aviation Company
Dayton Municipal Airport
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J. D. Reed Co., Inc.
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Houston, Texas

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Indianapolis, Ind.

Tradewind Airport Corp.
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Amarillo, Texas

Tulsair Distributors, Inc.
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Tulsa, Oklahoma

Wings, Incorporated
Wings Field
Ambler, Pennsylvania

Philadelphia International Airport
Philadelphia, Pennsylvania

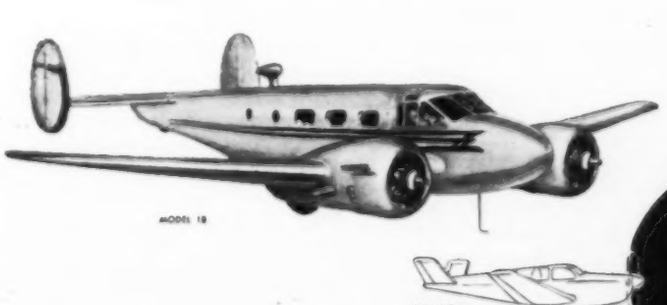
Airport Management Conference Oct. 11-12

sell to a subsequent lessor, agreeable

William Johnson finds it easy to do "double duty"

Mr. Johnson has an important desk job as General Manager of Charles B. Johnson, maker of sizing machines for textile mills. It's vital that he and other key men make field trips, too. The company's Twin-Engine Beech Executive Transport and Beechcraft Bonanza allow them to do *both* jobs. They clip travel time as much as 75%! Today, with mills filling government contracts, these Beechcrafts help keep production rolling. Example: A Johnson Sizer in a deep-south mill after long operation needed a replacement part. Thanks to Beechcraft "special delivery," the machine was idle just four hours!

The sleek, unsurpassed Beech "Twin" is a familiar sight on all the world's airports. Its versatility, reliability and high performance characteristics have been proved in service of leading industries and the Armed Forces. The cabin is comfortable and soundproofed—with several custom-interior plans available. With maximum speed of 230 mph, the Beech Executive Transport gives executives complete mobility of action, any time, any season. See your Beechcraft distributor for details. Or write Beech Aircraft Corporation, Wichita, Kansas, U. S. A.



- Cruising speed, 200 mph
- Range up to 900 miles
- Service ceiling, 20,500 feet
- Seating arrangements for 7, 8 or 9

Beechcraft

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

Airport Management Conference Oct. 11-12

A FULL program covering a wide range of current problems with discussions by national leaders has been arranged for the 1951 Conference on Airport Management and Operations, which will be held October 11-12 at the University of Oklahoma, Norman, Oklahoma. Jointly sponsored and arranged by the University and FLIGHT MAGAZINE in cooperation with the 4th Region CAA Airports Division, the Conference annually draws a large attendance from all regions of the nation. Housing on the campus is arranged.

Questions and Answers for Airport Operators

Private Hangars on Municipal Airports

A NUMBER of questions have come to our Question and Answer man lately on one subject—privately-owned hangars on municipal airports.

Many officials of public agencies owning airports do not realize that shops and hangars, large and small, are facilities essential to an active airport. People who plan to own and use modern aircraft in business and industry are reluctant to buy unless they can be assured of clean, safe storage space.

When public money for additional hangar space is not available or when public agencies are reluctant to provide such space, the only recourse is private capital. Too often, officials of public agencies do not recognize the advantages of such additional facilities and tend to requirements which discourage the private investor. The usual results of such construction by private funds are not just income for the private investor alone. They produce greater sales for aircraft, repairs, gas, oil and concessions. All of this increases the prosperity of the owning agency as well as the operators and concessionaires.

Surprisingly enough, one of the questions that has been asked several times is whether the CAA regulations permit hangars to be built with private capital on public airports which have been built either with Federal aid or have been acquired by public agencies through surplus disposal. We are authoritatively advised that it's not the policy of the CAA to oppose in any way the construction of additional hangar facilities with private funds in such instances so long as the location is in accordance with the master plans of the airport and not in violation otherwise of the terms of the "Grant Agreement" or "Transfer Document." In fact, most CAA people feel that the construction of hangar facilities with private money has just as important a place in the scheme of things as the construction of the same facilities with public money.

Another question, in varied form, has indicated that negotiations for the building of hangars with private funds has been stopped either by policies of public agencies or by statutory limits which made it impossible for the public agency to enter into a ground lease for a period of sufficient duration to enable the prospective private investor to amortize his investment on a reasonable basis. Where this condition has resulted in inability to arrive at a lease for ground space for private construction of hangars and where no public money is available or willingly can be spent for this purpose, then it seems that the owning agencies should consider carefully changing their policies or getting their statutory limits amended.

The need for more hangars, especially on small fields and those serving smaller communities, may have a material effect on the number of aircraft owned, and limitations of hangar space on major airports contributes to the factors that make people reluctant to own aircraft. If public officials, as well as those with private funds to invest, will consider the two major approaches to such leases or agreements, perhaps considerable building may be encouraged.

There are a number of ways to set up ground leases for this purpose. Two are frequently encountered. The first of these is a lease for a term of years on a plot of ground in conformity with the master plan, giving to the lessee permission to construct a hangar or hangars of a design and size to be approved by the public agency, such improvements to remain the property of the builder.

This type of lease has several elements of danger in it, the first of which is what becomes of the hangar at the end of the lease. The builder and owner should be protected, we believe, by specific provisions defining the rights of the lessee as well as the lessor at the end of the lease period. This may be done in several ways: 1. An option to renew the ground lease for a given period. 2. A right to sell to a subsequent lessor, agreeable to the owning agency. 3. Right of the owning agency to purchase at an appraised or amortized value if the buildings are not removed or sold. 4. Provision that at the termination of the lease, the private owner may remove and restore the property.

This latter provision is often entered into without due study as to the costs of removal and the loss in capital investment involved. When a man removes a hangar he can't remove the flooring and footings and use them again. Dismantling and moving is costly and reconstruction requires that a site be available for that purpose.

The second type of lease most commonly encountered provides that such a hangar built with private funds on grounds leased from a public agency becomes the property of that public agency at the expiration of the lease for the ground or some subsequent option to renew. This type of lease usually requires a considerable term of years in order that the builder may have enough time to write off the investment at an annual rate that will approximate what he would pay if he rented a publicly-owned hangar at the same location.

Many owning agencies object to allowing long terms because they do not want to lose control of their own property for such a long period of time. This is understandable. But it can also be understood that the private investor seeking a 20-year lease as a reasonable time, must, under a 10-year lease, actually write off his investment at an annual rate twice that which he desired in seeking a 20-year lease.

For example, a hangar costing $50,000, if written off in 20 years, would mean an annual write-off of $2,500 which might be very close to the rent he would have to pay for such a building, but if he had to write it off in 10 years it would double this to $5,000 a year. The same applies to any size building and the reasonableness of the terms can be measured in dollars and cents when compared with going rentals for the same type and area.

In fact, it is probable that in many cases the rate of write-off must be over a period of 30 years in order to make the amortization comparable with rental rates.

On the other hand we believe that the economic feasibility of private investment in hangars and shops is closely related to the costs of occupancy to the owner when compared with prevailing rental rates.

These two major objections to long term leases, i. e., loss of control of building area and long term leases, may reasonably be considered and solutions found. If a public agency and a private investor can come to terms which are reasonable to both parties, it should have the effect of increasing

(Continued on page 38)

BETTER BUSINESS through BETTER SERVICE

PENNSYLVANIA AVIATION CORPORATION, operating at Harrisburg State Airport, New Cumberland, Pa., provides complete facilities for itinerant flyers—fast in-and-out service, hangar storage, dependable repairs and overhauls. In addition, P.A.C. operates an outstanding flying school and provides charter service. Texaco Aviation Lubricants and Fuels are used and sold exclusively.

OWNERS OF Pennsylvania Aviation Corporation are T. Foster Thomas (left) and Clarke L. Smith. Both served long aviation apprenticeships as barnstormers, air mail pickup and aerial survey pilots. They know what flyers want and need, and see that they get it. They say: "We give Texaco, with its nation-wide reputation, credit for helping us build a successful business."

...when backed by quality products–TEXACO

That's the advice you'd get if you talked to Foster Thomas or Clarke Smith, owners of Pennsylvania Aviation Corporation. They'd tell you: "We've been mighty successful here at Harrisburg State Airport. We give flyers fast and dependable service, and supply them with the best in aviation products—Texaco."

That's the experience of fixed base operators everywhere. Good service backed by Texaco quality *brings in the business.* And there's no question about Texaco leadership in the aviation field. That's amply proved by this fact alone—

More revenue airline miles in the U. S. are flown with Texaco Aircraft Engine Oil than with any other brand.

You'll profit by handling Texaco Aviation Lubricants and Fuels. Get specific facts and figures from a Texaco Aviation Representative. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, *Aviation Division,* 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Lubricants and Fuels
FOR THE AVIATION INDUSTRY

TEMCO Rated High in Quality Control

All Production Processes, Testing Methods and Laboratories Have Top Rating

Strict administration of Quality Control has played an important part in TEMCO's progress in the engineering and manufacture of aircraft. The procedures, methods, and equipment used at TEMCO all are recognized by the Navy and Air Force, certified by the Government, or licensed by the Civil Aeronautics Administration. Above everything else, the men who use these procedures, methods and equipment, possess the one quality for which there is no substitute — experience. Of all the men now employed in the TEMCO inspection department, more than 47 percent have from 7 to 25 years actual aircraft inspection experience to their credit, while another 32 percent have from 5 to 7 years.

Quality Control Starts With Men in Shop

Hanging on the wall of a TEMCO Production Superintendent's office is a sign which reads:

> "Quality Must Be Built Into a Product—It Can't Be Inspected Into It!"

These words could well be called the motto of TEMCO's production departments, for the men in the TEMCO shop know that it is they — the machinists, the riveters, the installers, the assemblers and the men on the sheet metal benches — who are responsible for the ultimate quality of TEMCO products — not the inspectors.

To these men the inspector is important not as a source of quality, but as a guarantee that each part and assembly has the quality which only they — the men who built it — can put into it.

TEMCO Building Major Assemblies for Martin

Work is getting under way at TEMCO on major assemblies for the P5M-1 Marlin Flying Boat manufactured by the Glenn L. Martin Company of Baltimore, Md.

The Marlin is one of the Navy's most modern patrol bombers, a successor to the PBM series made famous during World War II.

TEMCO

ENGINEERS AND MANUFACTURERS FOR THE AIRCRAFT INDUSTRY

From Receiving to Flyaway

From the time the raw stock entered the TEMCO plant to final flight test as part of a completed airplane, this one forging benefited from eleven different inspections — Receiving, Zyglo, Tooling, Machine Shop, Heat Treat: Processing, Paint, Installation, and Final Acceptance by Flight Testing.

Performing the inspections on this one part were inspectors whose cumulative aircraft experience totals 118 years or 245,440 man-hours.

This is not an exception, but a typical example of the strict inspection procedures applied by TEMCO, and the experience which TEMCO has available to insure their proper application.

TEMCO
TEXAS ENGINEERING AND MANUFACTURING CO. INC.

Texas Engineering and Manufacturing Co., Inc.

DALLAS, TEXAS

PIPER TRI-PACER

(Continued from Page 28)

planes which came into Odessa while we were there were a Twin Beech with oil company officials, a 2-place Luscombe and a Piper Super Cub with a spray rig which was spraying some crops.

Off of Odessa at 1:47 p. m., we tried our rate of climb in the heat of the afternoon. Loaded as we were near gross weight, we got about 600 to 700 feet per min. for the first minute (the Odessa airport is at 3,000-ft. elevation and the temperature was above 90 degrees). We topped 9,000 ft. in 12 minutes, averaging 500 ft. per min. for the 6,000-ft. climb. During this, we experimented to find the best climbing speed, which turned out to be about 85 mph.

Cruised out at 9,000 ft., and using 2,450 rpm., our indicated air speed was 110 mph. Since the Tri-Pacer had no outside air temperature gauge, it is difficult to be too accurate in correcting our indicated air speeds but this would be about 130 mph. Later, we climbed to 10,500 ft., and indicated about 107 mph., for an approximate true air speed of about 127 mph.

Landing at Fort Worth at 4:20 p. m., we had flown 301 miles in 2 hrs. and 33 mins., ground-to-ground, averaging 118.5 mph.

We found the Tri-Pacer to be Cub-like in its stall characteristics, with very slight buffeting. The air speed indicator has very narrow spacing down in the less than 70-mph. marks but by counting as closely as we could in a power-on stall, we read it as 48 mph.

Shooting some landings, we were prone to bring it in with extra speed because of the load. But we found the best approach speed to be about 80 mph. over the fence, putting it on at about 55 mph. This is not only because the Tri-Pacer is plumb through flying fairly quick in landing but also because we were flying in very hot weather, the thermometer at Fort Worth registering about 100 degrees F.

The flaps on the Tri-Pacer are actuated by a hand-lever close to the floor between the two front seats. There are two positions, partial and full. In landing, we noticed tail-heaviness the moment the flaps were actuated. This is the reverse of what happens in most airplanes, which become nose-heavy when flaps are extended. Nose-heaviness is more desirable, since tail-heaviness slows you down still more after your flaps begin slowing the airplane. The Tri-Pacer's tail-heaviness is not to be mistaken as any sort of "ballooning." It lifts the nose just as if the stabilizer were being rolled back. Instead of trimming for tail-heaviness in the Tri-Pacer, the pilot should first slow the airplane to normal glide speed and then apply flaps. This should trim the airplane for a normal glide. The way we were doing, we were holding forward pressure against the flaps.

The Tri-Pacer we flew had a fixed-pitch McCauley propeller. Its Lycoming O-290-D engine develops 125 hp. at 2,600 rpm. Features included an excellent Bendix radio with a nice cabin dome speaker. Factory details are listed as follows: Empty weight 1,000 lbs., gross weight 1,800 lbs., span 29.3 ft., wing area 147.5 ft., length 20.4 ft., height 100 ins., baggage capacity 50 lbs., fuel capacity 36 gals., top speed 133 mph., cruising speed at sea level 123 mph., stall speed with flaps, 48 mph., rate of climb 810 ft. per min., fuel consumption 7.7 gals. per hr., cruising range 580 mi., service ceiling 15,500 ft.

We found the Tri-Pacer to be the best Piper model yet, being especially partial to nose wheels along with a great many other people.

★ ★ ★

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AIR REPORT

(Continued from Page 7)

Field. The Armed Services Petroleum Purchasing Agency contracted for the civilian service.

CIVIL AIR PATROL: CAP enrollment has hit a new peacetime high, with cadet membership at 39,668 after a gain of 1,708 in July and with 1,301 new seniors boosting senior enrollment to 53,666 for a total of 93,334 CAP personnel comprising 1,465 units throughout the U. S. and its possessions. . . . The 1951 International CAP Cadet Exchange Program was the most successful ever, with 110 participants from 14 foreign countries visiting 14 states as guests of CAP. After a big send-off in Washington, the Canadian and Swiss participants were flown to Texas where their tour began with CAP Vice Chairman Harold Byrd's annual wild-game dinner party.

FORTY YEARS IN AVIATION brought honors from many friends and aviation leaders last month to Pop Cleveland at the Carter Hotel in Cleveland, where a committee headed by Casey Jones drummed up the special occasion. Pop soloed in 1911.

MAJOR W. F. (BILL) LONG has

(Continued on Page 42)

QUESTIONS AND ANSWERS

(Continued from page 34)

the willingness of private investors to build hangars on public airports. Take, for instance, the large hangar described above to cost $50,000. If the prevailing rent on such a building would run $2,500 a year, then the owner would need 20 years to come out on his investment. If the lease between the parties stipulated a 20-year term and gave to the public agency the right to cancel the lease on notice after the first 10 years provided the public agency purchased the building at the original cost less 5 per cent per annum over the expired portion of the lease, then both parties would be protected. The public agency would, in effect, have control of its own grounds beyond the 10-year period and the lessee would have the protection of being paid for the portion of the cost not written off.

If we consider the same hangar and find the prevailing rent is roughly $1,667 per year, a satisfactory lease can be made on this basis. A 20-year lease is indicated, with a cancellation clause enabling the public agency to cancel on notice at any time after the first 10 years, providing the public agency purchases the improvements at the original cost less 3.3 per cent per annum for the expired portion of the lease.

This, of course, leaves a hangover of 10 years' write-off at the end of the 20-year lease period. In that case it could be provided in the lease that the public agency had the option of extending the lease 10 years or paying the lessee the remaining 33⅓ per cent of the original cost remaining and not written off.

There are other elements in the cost of occupancy such as maintenance and insurance which we have not covered but which can be figured in any calculations. The main thing about this matter of private funds for hangars on public airports is that when they are necessary both parties should endeavor to meet in a common solution to encourage this type of investment. Ground rents must be reasonable or they will push the cost of occupancy out of line.

Too much emphasis can not be laid on the desirability of maintaining hangar capacity sufficient to take care of potential sale of aircraft to users. We cannot give legal advice but we do believe that a pencil and paper and common-sense figures will show the way to arrive at terms and financial conditions of ground leases for hangar construction which will encourage increasing use and ownership of aircraft on your airport.

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Airmen's Calendar

Oct. 11-12 — 1951 Conference on Airport Management and Operations, University of Oklahoma, Norman, Oklahoma.

Oct. 24-25—National Association of State Aviation Officials Annual Convention, Tucson, Arizona.

Nov. 7—Annual Wings Club Dinner, Waldorf-Astoria Hotel, New York City.

Nov. 13-16 — National Aviation Trade Association Annual Convention, Fort Worth, Texas.

HIGH FRONTIER

(Continued from page 18)

subjected for hours on end to actual conditions in B-36 flight tests. There was the case of the rubber-like material formerly installed on bomb door limit switches. When the doors opened at very high altitudes, the cushion which protected them at lower altitudes shattered into nothingness and damage resulted. Synthetic cushioning which would not become brittle had to be developed to avoid damaging the limit switches and doors.

The glass windows and their housings on the B-36 have to withstand unprecedented conditions. With outside atmosphere temperatures at minus 100 degrees, heat must be applied to the inside surface of the glass for defrosting. This heat, piped from the engines and splashed against the subfreezing glass, has to run as high as 200 degrees F. to be effective. This imposes a 300-degree temperature differential between inside and outside surfaces of the glass—which must withstand the additional burden of 7.5 pounds of cabin pressure per square inch while retaining its shape and strength. A 10-inch square pane would carry a load of 750 pounds, but the curved sighting windows in a B-36 must withstand some 3,000 pounds of force or more.

Flight's Strangest Realm

Pilotage above 45,000 feet calls for many adjustments to curious phenomena and unnatural conditions. There is very little diffusion of light rays at such heights. This gives the atmosphere a twilight condition. Look straight up from 45,000 feet and the sky is as purplish dark as a blue serge suit. Look out across space and objects become difficult to locate and track—objects, that is, such as airplanes, which can pass unnoticed because, as in moonlight, they are not highlighted. Light strikes a passing plane from one direction only, there being no benefit of diffusion. If you have another airplane

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to ten miles up and it's a challenging environment," says the test pilot who

aircraft will already have solved many of the problems of stratospheric flight.

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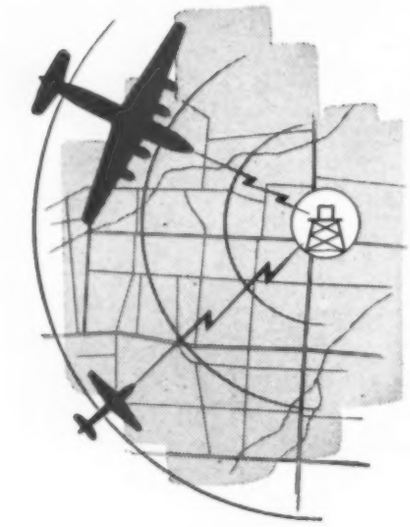

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in sight, it is difficult to locate it once you move your eyes away. Inside the cockpit, shadows are soft and dim, eliminating the sharp contrast between light and shadow found in lower altitudes. Instruments are finished in highest possible contrast for easy reading.

Visual scanning of a tremendous scope fascinates the pilot near 50,000 feet. Sweeping the horizon on a cloudless day and with sufficient visibility, his eyes cover a 300-mile radius—flying midway between St. Louis, Missouri, and Fort Worth, Texas, for example, the B-36 pilot has both cities in sight. Cities 30 or 40 miles apart, such as Fort Worth and Dallas, appear as a single blur.

"Your eyes cover so much you see very little of anything in particular," says Erickson. "Details escape you and the panorama is so great as to become confusing. The airman sees only the cities, for example—he misses all the villages, streams, railroads, and highways."

Something else happens to vision above 45,000 feet, the veteran test pilot says. Comparative distances as represented on conventional navigation charts become useless. In ordinary flying at conventional altitudes, such as 8,000 to 10,000 feet, the angle of vision helps an airman determine his distance from check points. This perspective goes haywire at very high altitudes.

"Look almost straight down from a B-36 cockpit at 45,000 feet, and the check point below may be 60 miles away instead of directly underneath," he says. "It is mighty easy to become confused right over your own airport. Once this happens, you become lost at a very fast rate because the errors in distances are so large. In fact, visual navigation from city to city becomes very nearly impractical even in daylight, and at night it is hopeless."

Radar devices fill in the gaps for the B-36 navigator, who uses this marvel to retain the rivers and the streams and other landmarks which the eye loses at altitude. With radar he couples celestial navigation.

Weather conditions are generally uniform at B-36 heights, but there are exceptions. For example, Erickson has encountered thunderheads topping 50,000 feet. He has also encountered very high velocity westerly winds, which blow at speeds as high as 300 mph. Turbulence in an absolutely clear, sub-zero-cold sky is experienced when wind shifts involving high velocities are encountered. The atmosphere can also become unbelievably smooth, with the airplane maintaining perfect hands-off trim for long periods of time. On other occasions, gentle but long "swells" are experienced, with the airplane gradually rising and lowering without any change in air speed or trim.

Because atmospheric density falls off greatly with high altitude, true air speeds increase sharply. At 40,000 feet, the correction for indicated air speed is approximately 100 per cent, so that an airplane indicating about 200 mph. is actually moving through the atmosphere at a speed of about 400 mph.

Like vision from the stratosphere, radio reception is so wonderful it is actually too good to be practical. Range is literally out of this world, so to speak. That's where the rub comes in.

"I want to tune in a tower in City X, but on its frequency I get 59 other cites as well as X," says Erickson. "When I transmit, my message is intended for X but 59 other towers get it, too. You can see that this is bedlam. People keep calling and asking who's messing up their transmissions and why don't we shut up."

This and other radio confusion results from band allocation problems which will have to be resolved eventually.

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AIR REPORT

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to ten miles up and it's a challenging environment," says the test pilot who has hundreds of hours above 40,000 feet behind him. "While it would be foolish to minimize any of the problems involved, it would be shortsighted and defeatist to discount fullest possible utilization of flight advantages in the stratosphere.

"The stratosphere is being conquered now by the B-36 for military necessity. Just as surely it will be conquered for commercial advantages, and it will no doubt be conquered more easily, because the B-36 and other military aircraft will already have solved many of the problems of stratospheric flight. Men will perfect aircraft which will operate up there with as much margin of safety or more than has been accomplished at lower altitudes. That will be a wonderful day when it comes, because air transportation will then completely surpass any other form of travel for passengers and cargo."

★ ★ ★

JUST AMONG OURSELVES

(Continued from page 9)

have to, or go out of business.

There is a valuable lesson in air carrier experience for owners and operators of private planes, especially those utilized by business men for transportation. But some of these people have yet to learn this lesson, judging from occasional accident reports which come our way. You don't have to look too closely to find airplanes you wouldn't start a trip in, or an occasional pilot hired without sufficient experience and judgment to meet all the flying requirements of the job and equipment he is assigned to. Sooner or later he gets in over his head and makes one mistake too many. Or he ignores the necessity for adequate equipment and maintenance, not knowing any better.

If you don't know your requirements, trip cancellations and even accidents can be avoided through insistence on the most exacting inspection. Instead of attempting to fly on a shoestring or chisel a bargain from somebody, pilots and owners should heed the experience of the airlines and adopt inspection and performance requirements as closely paralleling air carrier standards as possible. Ham-handed mechanics and slip-shod inspections are the most expensive in the long run—if it is transportation you want out of your airplane. In a business where *safety is the dollar mark*, phony bargains can cost you plenty, including your life. ★ ★ ★

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AIR REPORT

(Continued from Page 38)

resumed active control and management of Dallas Aero Service at Love Field. The 25-year-old firm has been under lease to another concern since 1945. . . . **HARRY M. CHASE, INC.**, operator of Dallas Aero Service since 1945, has moved from Love Field to Garland Airport (old Hudson Airport) in Dallas, and is operating as "Executive Aircraft Service."

RYAN "FLYING-BUSINESS-MAN-OF-THE-MONTH" HONORS were bestowed last month on Dr. E. W. K. Andrau of Houston, Texas, who uses a Navion 260 in his oil, rice farming and ranching activities. He also owns and operates Andrau Airpark in Houston and is dealer for the De Havilland Dove.

MARIE TINNEY, artistic wife of Continental Motors' Bob Tinney, is fast becoming the nation's top hand-painted tie expert. She did one for us with covers from the magazine as the decoration. For $3.50 she'll paint anything you want on any color tie and furnish the hand-sewn tie. If you want one of these collector's items, Marie can be reached at 3234 Tracy, Kansas City, Mo. ★ ★ ★

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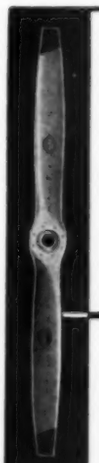

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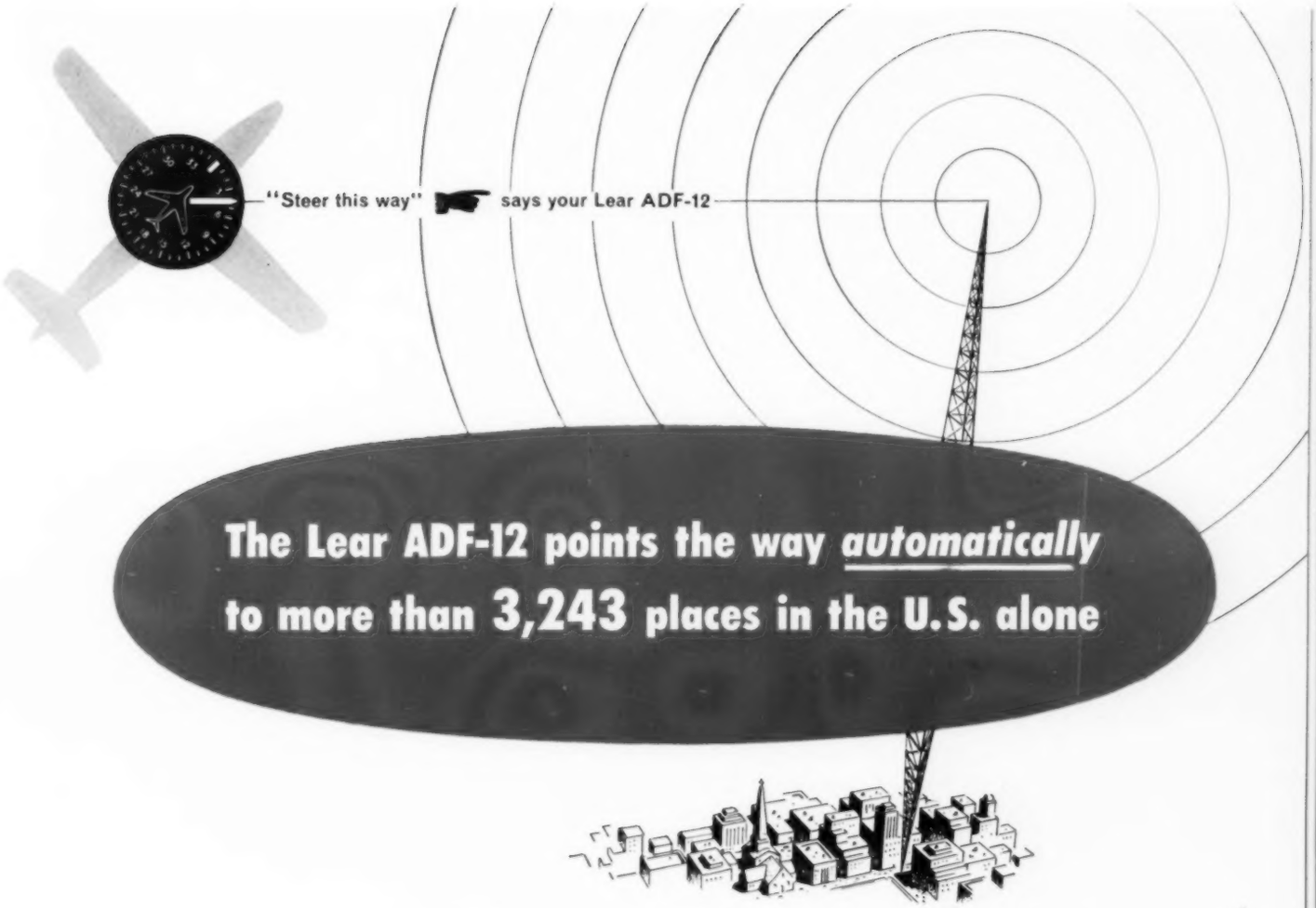

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The ADF-12 contains provisions for furnishing modulation and power to Lear VHF transmitters

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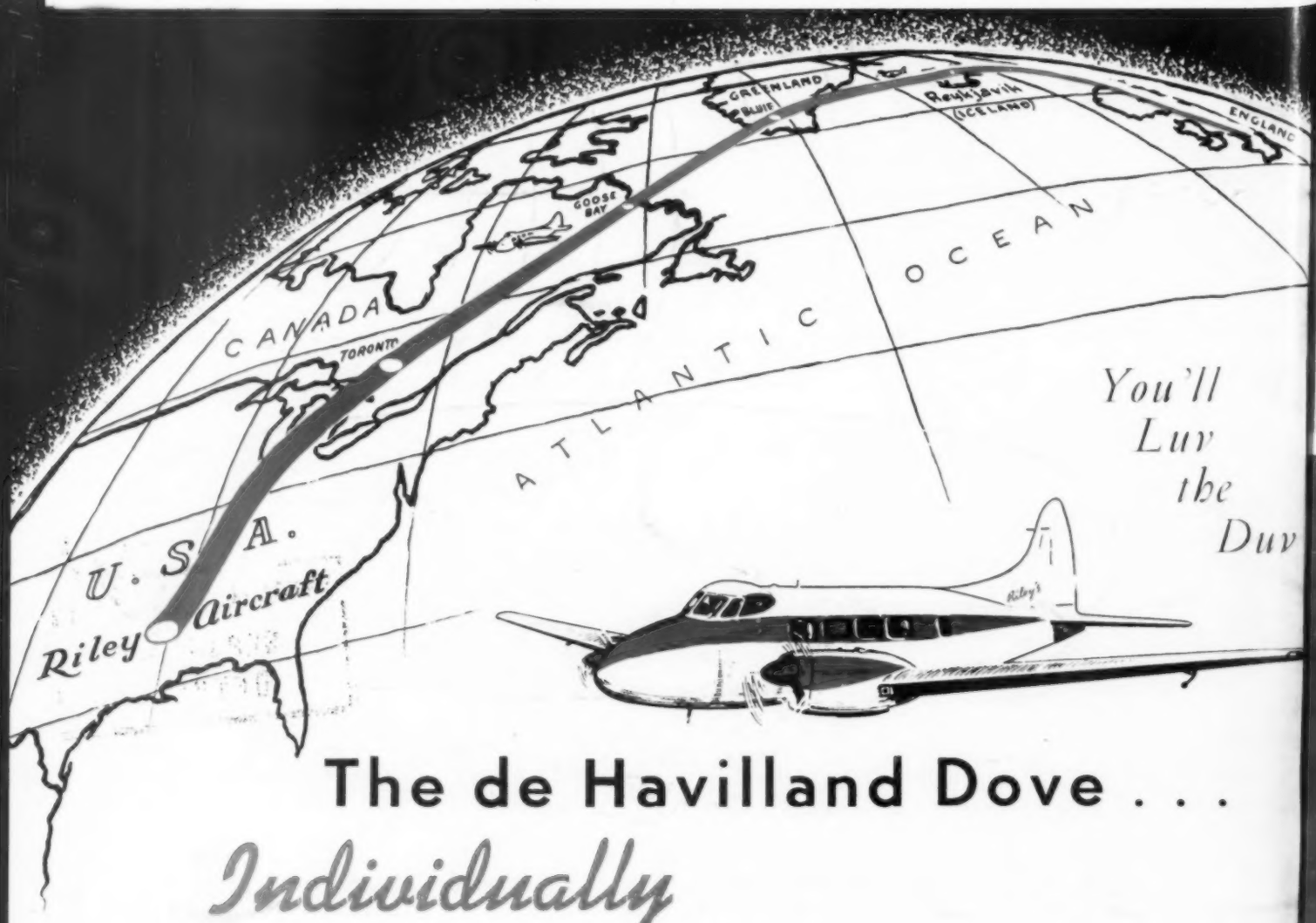

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Individually

Proven Dependable!

Yes, because DOVES are currently being ferried across the North Atlantic for delivery to Riley Aircraft in the U. S. A. . . . **each DOVE** has it's already-known dependability **proven** again immediately before delivery to the constantly growing list of new owners.

DOVES do not require special equipment for the crossing. ALL DOVES are given final testing and certification at de Havilland's Canadian factory in Toronto.

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